The Republic of South Sudan

South Sudan's

# Second Nationally Determined Contribution

MINISTRY OF ENVIRONMENT & FORESTRY
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# Second Nationally Determined Contribution

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# FOREWORD

This document presents South Sudan's second Nationally Determined Contribution (NDC); it updates the first NDC to include the country's changing climate and its development considerations. South Sudan has come a long way since it published its first NDC with the development of its detailed greenhouse gas inventory (published in its National Communication to the United Nations Framework Convention on Climate Change), the establishment of its National Adaptation Programme of Action, and the development of other climate-related sectoral plans and policies. In addition to these elements, South Sudan, as part of this NDC revision process, has also carried out a detailed science-based metabolic and circularity assessment to inform its revised climate-related strategies. All of this progress is presented in detail in this document.

South Sudan, through this second NDC, reiterates its commitment to the Paris Agreement goal of limiting global temperature rise to well below 2 degrees Celsius above pre-industrial levels, while making efforts to limit the increase to 1.5 degrees Celsius. It details how South Sudan has significantly increased its climate ambition of reducing emissions across its sectors by 109.87 million tonnes of carbon dioxide equivalent while sequestering an additional 45.06 million tonnes by 2030.

As part of South Sudan's increased ambition, this second NDC has also increased the country's sectoral coverage, and instituted additional mitigation and adaptation measures in sectors that were included in the first NDC. These strategies have been designed to ensure that South Sudan adopts a sustainable and low-carbon growth pathway while also supporting the country's vision to 'transition from a least developed country to a middle-income country by 2030 supported by inclusive, stable and sustainable economic growth whilst alleviating poverty'.

Thus, recognizing the importance of this document in ascertaining South Sudan's sustainable economic future, it covers energy- and emission-intensive sectors such as petroleum and mining, which are key economic drivers for the country. In this regard, a detailed exercise was carried out to identify and prioritize the top 14 sectors that would have a significant impact on South Sudan's economic and low-carbon future. This second NDC explores each sector in granular detail, providing an in-depth assessment of its individual adaptive or mitigative potential together with the strategies required to meet that potential. Furthermore, addressing the need to view climate-related activities through a holistic lens, it goes beyond the element of emission reductions; this second NDC also accounts for impacts on various social aspects, such as gender responsiveness and employment opportunities, for each NDC sector.

This document has been developed through an extensive participatory process wherein stakeholders representing government institutions, and developmental and financing mechanisms throughout every level of governance, and those representing civil society, have incorporated their views and aspirations within it. Thus, South Sudan's second NDC document is a truly national document that will govern South Sudan's future in an economically and environmentally sustainable manner.

**H.E. Gen. Salva Kiir Mayardit**
**President of the Republic of South Sudan**

# PREFACE

South Sudan is a least-developed country located in East-Central Africa. It is the world's newest country, having gained independence from Sudan in July 2011 after a prolonged civil war. In addition to the negative impacts of long-term conflict, communities in South Sudan are facing the negative effects of a changing climate. In general, the country is experiencing substantially warmer and drier weather, and more droughts. In addition, rainfall is becoming more erratic, and the frequency and severity of floods is increasing. These effects of climate change, in turn, decrease agricultural productivity, upon which the majority of the population depends for their livelihoods. Unless communities adapt, climate change will hinder socio-economic development and contribute to existing tensions and conflicts over natural resources in South Sudan.

Therefore, in response to the negative impacts of climate change, the Republic of South Sudan, in its second Nationally Determined Contribution (NDC), has identified key sectors, climate actions (mitigation and adaptation), strategies and plans that are aimed at contributing to ambitious international long-term goals of limiting global warming and building resilience to climate impacts in the context of sustainable development. In addition, South Sudan has developed strategies to mobilize resources and for communication to help achieve the climate-change actions and strategies identified under the NDC. Implementation of these measures and policies will achieve a low-carbon development pathway while reducing the vulnerability of its population, environment and economy, thereby building resilience and ensuring national ownership and commitment.

The NDC should be mainstreamed in the development planning process across different government sectors to ensure climate-centric development for long-term resilience and to interrupt the poverty cycle. The processes followed in implementing the NDC will allow South Sudan to tackle the impacts of climate change that threaten humankind.

Lastly, it has been my honour and pleasure to write these introductory remarks and endorse the Republic of South Sudan's second NDC. This document, and the process that it represents, is the first step on the road to a prosperous and climate-resilient future for all South Sudanese.

**Hon. Josephine Napwon Cosmas**
**Minister of Environment and Forestry**
**Republic of South Sudan**

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We would also like to thank Mr John Payai Manyok, the Deputy Director and United Nations Framework Convention on Climate Change National Focal Point for South Sudan, and his supporting staff from the Ministry of Environment and Forestry for their continual guidance and support during the preparation and validation of this NDC.

As representatives of the Ministry of Environment and Forestry, we would like to express our gratitude and appreciation to all stakeholders who shared their valuable time and provided valuable input and information during consultations and the NDC validation workshop, even during the COVID-19 pandemic. This includes government line ministries; the local governments of Central and Eastern Equatoria states; academic and research institutions; non-governmental and community-based organizations; representatives of women, youth and the general public of South Sudan; and the media.

We extend special gratitude to Ambassadors to South Sudan Marc Trouyet of France, Naohiro Tsutsumi of Japan, Jelta van Wieren of The Netherlands, S.D. Moorthy of India and Jonny Baxter of the United Kingdom for their precious time and inputs based on their NDC experiences in their respective countries.

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Finally, special thanks go to UNDP's Climate Promise for funding the revision of South Sudan's NDC, and to KPMG for producing South Sudan's second NDC.

**Hon. Joseph Africano Bartel**
**Undersecretary of Environment,**
**Ministry of Environment and Forestry**
**Republic of South Sudan**

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| **AfDB** | African Development Bank |
| **CAMP** | Comprehensive Agriculture Master Plan |
| **$CH_4$** | methane |
| **$CO_2$** | carbon dioxide |
| **ER** | emission reduction |
| **ESIA** | environmental and social impact assessment |
| **EV** | electric vehicle |
| **FAO** | Food and Agriculture Organization |
| **FY** | financial year |
| **GDP** | gross domestic product |
| **GHG** | greenhouse gas |
| **JICA** | Japan International Cooperation Agency |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **LULUCF** | land use, land use change and forestry |
| **$m^2$** | square metre |
| **MW** | megawatt |
| **$N_2O$** | nitrous oxide |
| **NAPA** | National Adaptation Programme of Action |
| **NATCOM** | Initial National Communication to the United Nations Framework Convention on Climate Change |
| **NDC** | Nationally Determined Contribution |
| **NDS** | National Development Strategy |
| **°C** | degree Celsius |
| **Ramsar** | Ramsar Convention on Wetlands of International Importance |
| **REDD** | Reducing Emissions from Deforestation and Forest Degradation |
| **SCP-HAT** | Sustainable Consumption and Production Hotspot Analysis Tool |
| **SDG** | Sustainable Development Goal |
| **t** | tonne (metric ton) |
| **$tCO_2e$** | tonnes of carbon dioxide equivalent |
| **UNDP** | United Nations Development Programme |
| **UNEP** | United Nations Environment Programme |
| **UNESCO** | United Nations Educational, Scientific and Cultural Organization |
| **USAID** | United States Agency for International Development |
| **WHO** | World Health Organization |
| **$** | United States dollar |
| **%** | percent |

# 1 EXECUTIVE **SUMMARY**


## EXECUTIVE SUMMARY

The Republic of South Sudan became a new nation after more than 50 years of civil war that took over 3 million lives and displaced over a million people. South Sudan gained its independence from Sudan on 9 July 2011 as the outcome of a 2005 agreement and became the 55th country in Africa. The protracted conflict destroyed the limited infrastructure and governance structures that existed before the conflict. In December 2013 and July 2016, renewed conflicts undermined the development gains made since independence and exacerbated the humanitarian crisis. The gradual implementation of the peace agreement of September 2018, which included establishing a unity government in February 2020 and an agreement on the number of states, gave a positive economic outlook in early 2020.

Along with the negative impacts of long-term conflicts, the adverse effects of changing climate are also being faced by the inhabitants of South Sudan. The country is experiencing an increasingly warm and dry climate with erratic rainfall. This is resulting in degradation of ecosystems and decreased agricultural productivity that is negatively impacting the livelihoods of a majority of the population. Political and economic instability, including limited access to capital, markets, infrastructure and technology, along with changing climate, are hindering the growth of the country.

Recognizing this, and to achieve sustainable economic development, South Sudan aims to transition from a least developed country to a middle-income country by 2030, supported by inclusive, stable and sustainable economic growth, while alleviating poverty. Promoting environmental sustainability, climate-resilient communities and appropriate land use has been identified as a critical enabler that will complement the eight strategic priorities of the National Development Strategy (NDS) 2018–2021 (South Sudan Ministry of Finance and Planning,

2018). To accomplish these goals, South Sudan has developed multiple sectoral policies and plans. This report presents the country's second Nationally Determined Contribution (NDC), putting forward the next generation of targets with the overarching goal of transitioning to a low-carbon economy by 2030.

## MATERIAL FLOW ANALYSIS (METABOLIC ASSESSMENT)

Decoupling economic growth from environmental pressures requires a combination of low-carbon development and efficiency in the use of resources. To achieve this efficiency, it is important to understand how these resources flow within an economy to produce requisite goods and services. Mapping out the flows and stocks[1] of a country helps bring efficiency in resource and energy use into the overall economic system.

South Sudan's history of economic growth trends against its resource consumption and emissions profile were studied as part of this assessment. It was found that South Sudan consumes fewer material resources than other countries. Given that it has a low rate of material consumption, South Sudan is likely to regenerate or renew its resources at a comparatively high rate. However, with increased economic growth and development this scenario could change.

Growth and development in South Sudan are currently significantly dependent on primary material consumption, i.e., biomass, fossil fuel, metal ores and non-metallic minerals. There is minimal decoupling between material use and the wider economy. Similarly, in the case of greenhouse gas (GHG) emissions, minimal decoupling is seen between South Sudan's economic growth and its GHG emissions. A summary of South Sudan's resource flows within sectors, likely change in stock, and outputs (GHG emissions) has been provided below:

- **Resource flows:** Biomass is the most consumed resource (57 percent) in the country. The majority of biomass is consumed by the industrial sector, followed by agriculture and public services (education, health and public administration). Fossil fuel is the second most consumed (41 percent) resource in the country and is primarily used in the construction and industrial sectors, followed by public services (education, health and public administration) and the petroleum sector itself.
- **Stocks:** All materials that flow in an economy have an origin and a destination and interact with various stocks in the process. Since the infrastructure base (physical stock) in the country is currently underdeveloped, the most used stocks in the country are its natural assets, i.e., arable land and forests. Both arable land under agriculture and physical infrastructure stock are likely to increase in the future. However, given the current annual rate of deforestation (2 percent), land under forestry is likely to reduce.
- **GHG emissions:** A gradual increase of GHG emissions has been observed over the years in South Sudan, from both a domestic production and resource consumption perspective. Emissions due to domestic production and resource consumption have been increasing at rates of 1.22 percent and 1.14 percent per annum, respectively. The slow rise in GHG emissions over the years parallels South Sudan's slow economic and population growth. GHG emissions from domestic production are mostly from the agriculture and livestock sector, followed by the petroleum and service sectors. In terms of resource consumption, industry and hotels, restaurants and other service sectors account for the greatest amount of GHG emissions, along with the agriculture and livestock sector.

1 Stocks refer to any natural and/or physical asset of a country.

While the population in South Sudan is increasing, the intensity of use of materials, carbon emissions and land use are observed to be decreasing. This signifies that South Sudan's environmental resources are increasingly being placed under pressure due to an increasing population. Furthermore, with the lack of decoupling between its environmental resources and economic growth, it is imperative that the country increasingly adopt a sustainable and circular lifestyle when it comes to utilizing its resources. This will have the dual impact of helping South Sudan decouple its economic growth from its resource use, while at the same time reducing the pressure of an increasing population on its resources.

The output of this assessment was used to identify circular opportunities for South Sudan in key economic sectors that include agriculture and livestock, forestry, energy, industry, infrastructure construction and waste. These strategies will help South Sudan move towards establishing a more circular economy.

## SECTOR PRIORITIZATION

A sector prioritization exercise was conducted to identify sectors for further assessment and inclusion in the NDC. Sectors were prioritized based on economic, environmental and socio-economic parameters that are key for South Sudan's development. The sectors were scored against each parameter and, based on their overall scores, were prioritized. Based on the final scores and their individual significance to South Sudan's development, eight sectors were identified. In addition to these sectors, additional sectors were included, based on the inputs of all relevant South Sudanese stakeholders, making a total of 14 sectors. These are as follows:

| | |
|---|---|
|  | **1. Agriculture, livestock and fisheries** |
|  | **2. Infrastructure (construction and buildings)** |
|  | **3. Forestry** |
|  | **4. Biodiversity, ecosystem and sustainable wetland management** |
|  | **5. Electricity** |
|  | **6. Water** |
|  | **7. Waste** |
|  | **8. Tourism and recreation** |
|  | **9. Mining and quarrying** |
|  | **10. Transport** |
|  | **11. Industry** |
|  | **12. Petroleum, chemicals and non-metallic mineral products** |
|  | **13. Health** |
|  | **14. Disaster risk management** |

## SECTORAL STRATEGIES

After finalizing the sectors to be included in the NDC, a detailed assessment of each sector was conducted. This assessment, along with the outputs of the material flow analysis, was used to develop mitigation and adaptation strategies for each individual sector. The timeframe that will be required for implementation of NDC strategies was also determined.

The proposed sectoral strategies, if implemented, will move South Sudan onto an ambitious decarbonization pathway compatible with the Paris Agreement's goal of holding global temperature rise to well below 2°C, with efforts to limit temperature rise to 1.5°C above pre-industrial levels. The table below summarizes the emission reduction pathway and estimated potential of emission reduction for each of the 10 mitigation sectors. In total, by implementing these strategies South Sudan can reduce an estimated 109.87 million tonnes of carbon dioxide equivalent ($tCO_2e$) and sequester 45.06 million $tCO_2e$ by 2030.

| Sector | Emission reduction pathway (till 2030) | Potential emission reduction (million $tCO_2e$) | Potential emission sequestration (million $tCO_2e$) |
|---|---|---|---|
| Agriculture, livestock and fisheries | 18% reduction in GHG emissions compared to 2017 level | 75.08 | – |
| Infrastructure (construction and buildings) | Procurement of green cement | 9.50 | – |
| Forestry | 70% reduction in deforested area | – | 45.06 |
| Electricity | Installation of 2,729.5 MW of renewable energy-based power plants (including hydropower) | 11.90 | – |
| Waste | 30% reduction in GHG emissions compared to baseline | 10.94 | – |
| Tourism and recreation | 66% reduction in GHG emissions related to hotels and restaurants compared to baseline | 0.02 | – |
| Mining and quarrying | – | – | – |
| Transport | 44% reduction in GHG emissions compared to baseline | 2.43 | – |
| Industry | – | – | – |
| Petroleum, chemical and non-metallic mineral products | – | – | – |
| **Total** | | **109.87** | **45.06** |

A summary of NDC sectoral strategies that will be implemented to achieved emission reduction targets is provided below.

### Agriculture, livestock and fisheries

*Agriculture and livestock*

The agriculture sector is one of the largest emitters of GHG emissions in South Sudan, with around 74 percent of the emissions coming from the sector in 2015. On the other hand, this sector is also highly vulnerable to the impacts of climate change. The majority of the population in South Sudan is dependent on agriculture and livestock for their livelihoods, yet agricultural productivity remains low in the country. Currently, a large proportion of the population of South Sudan is food insecure and with changes in the climatic pattern, this problem is likely to intensify. Therefore, growth of the agriculture sector and enhancing food security are key priority areas for both climate-related and development policies of South Sudan. However, most plans and projects are either in the implementation stage or are yet to be implemented.

Given the current status of the sector, agriculture will be considered to be a priority from both the climate change mitigation and adaptation standpoints in the second NDC. South Sudan aims to cumulatively reduce agricultural emissions by 23 percent by 2030 compared to baseline levels. To reduce its emissions footprint, South Sudan will focus on promotion and implementation of activities like crop rotation, reduced tillage, zero grazing and rotational grazing to allow carbon to remain in the soil, thereby reducing GHG emissions.

South Sudan will use its high agricultural production potential to create targeted agricultural hubs[2] promoting closed agricultural loops. This will not only allow for efficient growth in the sector but also enable waste management and recycling, resulting in a reduction in GHG emissions.

The second NDC will also focus on strategies for proper management of livestock, since enteric fermentation contributes significantly to overall agricultural emissions. From a climate change adaptation standpoint, promotion of climate-resilient agricultural and livestock management practices, water harvesting and diversification of livelihoods of pastoralists and communities dependent on agriculture will be key aspects of the second NDC.

*Fisheries*

As is the case with agriculture and livestock, fisheries are depended on by a large proportion of South Sudan's population for their livelihood. Employment in the sector has been steadily increasing, but overall there is a decreasing trend in fish production, which is indicative of inefficient harvesting practices and lack of infrastructure (e.g., cold storage). With climate change, the negative impact on fish production is likely to intensify. The Government of South Sudan, through its current NDC, Fisheries Policy and National Adaptation Programme of Action (NAPA) (South Sudan Ministry of Environment, 2016) therefore aims to enhance productivity through community-based adaptation strategies, while promoting alternate livelihood options. The sector is also considered to fall under other development policies, such as the Vision 2040 (South Sudan, 2011) and the NDS. The sector seems to be lagging in meeting its targets and utilizing the country's annual fish production potential.

The second NDC will continue to focus on enhancing climate-resilient fish production by promoting activities like the cultivation of indigenous fish species, fish farming and restoration of fishery habitats. It will also aim at enhancing the supply chain of the fisheries industry (e.g., supporting transport activities and cold storage). Furthermore, the second NDC will consider enhancing the capacity of communities

2 Agricultural hubs are interconnected agricultural market spaces that are established in close proximity to agricultural land allowing for quicker and more efficient transportation of agricultural produce and waste between the field and the market.

on climate change and promote aquaculture as an alternate livelihood option.

### Infrastructure (construction and buildings)

Currently, South Sudan lacks access to basic infrastructure (e.g., roads, water supply and sewerage). Therefore, development of infrastructure is currently a high priority area for the Government of South Sudan. The NDS provides three-year targets for infrastructure development (e.g., construction of transport, water and sanitation facilities) while the current NDC aims to consider climate change criteria in any new construction activity and promote development of climate-resilient infrastructure.

The second NDC will continue to promote the development of climate-resilient infrastructure for reducing South Sudan's vulnerability to climatic changes in future. It will also promote the adoption of national building codes to incorporate climate change criteria in the construction of new buildings. Since South Sudan is largely dependent on imported construction materials, the second NDC includes the development of sustainable and low-carbon procurement policies to regulate the importation of high-carbon construction materials to reduce their embedded emissions. By implementing such policies, South Sudan could achieve cumulative emission reduction of 9.5 million $tCO_2e$ (26 percent lower than the baseline) by 2030.

Furthermore, South Sudan will promote the reuse of construction waste, such as debris, wood or furniture. In the long term, this will reduce accumulation of construction waste and promote the use of secondary sources in construction, such as tiles made of recycled plastics. From an adaptation standpoint, South Sudan will encourage the development of climate-resilient infrastructure and develop regulations around conducting mandatory environmental and social impact assessment (ESIA), ensuring that large infrastructure projects have minimal environmental and social impact.

### Forestry

The majority of the population in South Sudan is dependent on forest products for their energy needs and livelihood. With a growing population and increasing developmental activities, the natural forests are increasingly under pressure from human activities, such as over-extraction and deforestation. The current rate of deforestation is estimated to be 2 percent. The Government of South Sudan has developed various policies, such as the National Forest Policy, the current NDC and the NAPA, to prevent deforestation and manage natural forest reserves. However, there seems to be lack of action in this area. Currently only 3 percent of the total forest area is gazetted as forest reserve, while the government's target is 30 percent. The rapid conversion of forest areas is also resulting in the net emission of GHGs.

To address this issue, the second NDC will support initiatives to improve forest management activities, including implementing policies and plans to reduce deforestation; encouraging regular monitoring of forest cover; and sustainable management of forest through community involvement. It will also encourage increased participation in international frameworks, such as the REDD+ programme, to gain access to international climate finance by reducing GHG emissions. The second NDC also focuses on introducing a community-based forest management approach for conserving forests and providing alternate livelihood options to communities. By implementing these initiatives, South Sudan aims to reduce the total deforested area by 70 percent by 2030 compared to 2018 levels. Reducing deforestation will increase the country's emission sequestration potential by 45 million $tCO_2e$ compared to the baseline by 2030.

### Biodiversity, ecosystems and sustainable wetland management

South Sudan is home to a wide variety of animal and plant species and globally important ecosystems. The diversity of these ecosystems is threatened

by the growing number of people, expansion of urban areas, high human dependence on natural ecosystems and increasing industrial activities such pollution and over-extraction of resources. As a result, the number of wildlife species has reduced significantly, and many wetlands have started degrading. Moreover, due to changes in water influx in the Sudd wetland, it is considered to be a major contributor of methane emissions globally. To address these concerns, the Government of South Sudan has developed various strategies, including the Wildlife Conservation and Protected Area Policy, current NDC and NAPA for protection of biodiversity, natural ecosystems and wetlands. Despite the sector being a priority, there is currently a lack of studies and baseline data to assess the status of biodiversity and to validate the results of a study on methane emissions from the Sudd wetlands.

Climate variability with increased deforestation will further intensify negative impacts on biodiversity, wildlife and wetlands. Therefore, the second NDC will support the development of wetland inventory, carry out ground research to monitor changes and promote measures for sustainable management of wetlands for improved carbon sequestration. It will also support conservation and management of biodiversity and ecosystems by promoting biodiversity mapping; implementing measures to reduce the deforestation rate by introducing alternate sources of energy and livelihood; and developing policies for effective waste management to prevent discharge of untreated waste into water bodies.

### Electricity

Access to grid electricity is very limited in South Sudan, with installed capacity being much lower than the demand. As a result, people are dependent on diesel power generators for electricity. Although South Sudan has high potential for renewable energy-based electricity generation, currently it is completely dependent on thermal power production. The government has identified and is carrying out feasibility studies for installation of various solar energy and hydropower-based projects as part of its NDC and other developmental policies. Moreover, the government has also started investing in multiple projects, which on completion are expected

to increase the share of renewable energy by 8 percent in total.

South Sudan will continue to focus on increasing the share of renewable energy in the total energy mix. By increasing the share of solar, wind, hydro and biomass, South Sudan aims at achieving cumulative emission reduction of 69 percent by 2030 compared to the baseline. South Sudan will also promote the use of energy-efficient technologies and decentralized renewable energy grids, which can be both time- and cost-effective, to increase electricity access in rural areas. In addition to its other benefits, increasing the contribution of renewable energy will enable South Sudan to gain access to international climate finance through carbon markets.

### Water

South Sudan does not have efficient water supply systems and wastewater management infrastructure. As a result, half the population does not have access to safe drinking water and access to sanitation facilities is even lower. This makes communities highly vulnerable to water-borne diseases and negative health impacts. The problem is likely to be exacerbated by the impact of climate change on water availability and reliability.

Although South Sudan's climate-related and development policies focus on improving access to drinking water and restoration of natural resources, given the current status, there seems to be a severe lack of action in the sector.

South Sudan will continue to focus on restoring its natural water resources, such as rivers and wetlands, which also provide a source of livelihood to a large number of people. To maintain water quality and reduce the transmission of water-borne diseases, the country will also consider the development of wastewater and effluent treatment plants; installing proper water supply infrastructure; and promoting the reuse and recycling of wastewater. It will also support development of water harvesting measures, rehabilitation of irrigation schemes and integrated water catchment management for ensuring adequate availability of water, especially in sectors such as agriculture and livestock.

### Waste

Most of the waste that is generated in South Sudan is either illegally dumped or openly burned. Moreover, the wastewater treatment facilities and sewer systems in the country are very underdeveloped. Due to growing population, lack of infrastructure and inefficient policies, waste management in South Sudan is becoming a serious environmental concern. The waste sector is also one of the highest contributors of GHG emissions. While the Government of South Sudan, through its current NDC and NAPA, focuses on enhancing solid and liquid waste management infrastructure, there seems to be a lack of on-ground action in the area.

South Sudan therefore considers waste a priority sector from both climate change mitigation and adaptation standpoints. The government aims to cumulatively reduce 19 percent of waste emissions by 2030 compared to the baseline level. For this the country will develop and implement a national level policy/plan for waste management. For this, South Sudan aims at utilizing the mitigation opportunities provided by the waste sector, which include composting, utilisation of methane from landfill, recycling and energy generation from waste. The second NDC will continue to promote the development of solid and liquid waste treatment facilities (effluent treatment plants in industry) to reduce the vulnerability of communities to negative health impacts by providing proper sanitation facilities and hygienic surroundings.

South Sudan will also promote waste prevention, minimization, recycling and reuse in different sectors, such as agriculture, hotels and restaurants, construction and industry (e.g., urban waste can be made into briquettes; crop residue can be composted; plastic waste can generate refuse-derived fuels, which can be used in industry; methane captured during flaring or biogas plants can be used to generate electricity; and construction material, such as wood, bricks and iron, can be recycled and reused). In addition, South Sudan will regulate extraction and use of primary sources to catalyse adoption of waste recycling. With a reduction in supply of primary resources, demand for recycled or reused resources will increase.

### Tourism and recreation

The tourism and recreation sector in South Sudan is currently in a phase of development. The government has developed a tourism policy that aims to promote tourism based on a variety of attractions in the country, such as natural forests and wildlife. The Vision 2040 and NDS documents also emphasize developing the tourism industry, particularly wildlife tourism facilities. While tourism is not a priority sector in the current NDC or NAPA, these plans do consider the development of climate-resilient tourism infrastructure and promotion of ecotourism. However, there seems be a lack of action on the ground in the sector due to a lack of finance and other resources.

South Sudan aims to ensure that the development of the tourism and recreation industry occurs in a low-carbon and sustainable manner. It also targets cumulative emission reduction of 40 percent by 2030 compared to the baseline. Since most of the tourist spots in South Sudan are of environmental importance, the second NDC will promote sustainable nature-based tourism to protect biodiversity and provide livelihood opportunities to local communities. As the sector grows, the second NDC will also promote efficient waste management (e.g., composting), increasing the share of renewable energy and improving energy efficiency in hotels and restaurants to reduce GHG emissions.

Furthermore, South Sudan will promote collaboration between the local tourism industry and sustainable food producers to improve the livelihoods of local communities, as well to reduce emissions from food production. South Sudan will also ensure that development of recreational infrastructure occurs in a sustainable manner with no negative impacts on the ecosystems and biodiversity of the region.

### Mining and quarrying

While South Sudan has abundant mineral wealth, commercial exploration activities are limited due to a lack of investment, minimal domestic industrial activity and a dearth of trained human resources. With a decline in oil production in recent years, the government is now promoting mining and quarrying activities, which are focused on in the Vision 2040 document. Mining is increasingly becoming a source of employment, with people in South Sudan moving from agriculture to mining, and with illegal small-scale mining for minerals like gold on the rise. This proliferation of illegal mining, which is not governed by limiting regulations or policies, could result in significant negative environmental impacts from increased, uncontrolled deforestation, soil erosion and open dumping of waste. While the government has developed a mining policy and mining act to regulate the growth of the sector and to minimize the harmful impacts of mining, this sector does not currently feature in the country's climate change policies.

With a push for growth in mining, emissions from the sector are likely to increase. This sector, if unchecked, will also have adverse impacts on land and water resources. Therefore, the second NDC will ensure that activities in the sector are controlled and regulated by the development of ESIA frameworks, environmental management plans and sustainable mining closure plans. They will also focus on developing efficient institutional and governance mechanisms to restrict illegal mining. Another important aspect of the NDC will be the development of environmental regulations and standards for air quality, water management, and effluent and hazardous waste management at mining sites.

### Transport

The transport infrastructure in South Sudan is underdeveloped, with most roads being inaccessible during the rainy season. This not only increases the cost of transportation but also has an impact on the economic growth of the country. Therefore, the government is currently focusing on development of transport infrastructure, which is a priority in most of South Sudan's development policies. The NDS provides three-year targets for development of road infrastructure and the current NDC focuses on the development of vehicular emission standards and exhaust testing centres to regulate the importation of old and inefficient vehicles. This will be supplemented by ambient air pollution standards and/or vehicular emission standards developed under the ambit of the second NDC.

Since the sector is expected to grow in the future, the second NDC will support sustainable growth by promoting the use of low-carbon transport technologies, such as electric vehicles (EVs). South Sudan will also focus on the development of policies to restrict the importation of inefficient vehicles to reduce GHG emissions and air pollution. Implementing these initiatives will help South Sudan reduce its transport emissions by 31 percent by 2030 compared to the baseline level.

### Industry

Most manufacturing industries in South Sudan are small scale. The country is largely dependent on imported goods and services and has minimal local manufacturing. Therefore, the majority of emissions from the industrial sector are embedded emissions from imported goods, with the maximum emissions being from the food and beverage industry. Emissions from industry are likely to rise in the future, with an increase in industrial activity as the country develops. However, as far as the current NDC and other policies are concerned, no consideration has been given to green growth of the sector.

Since industry is currently at a nascent stage in South Sudan, there is room for sustainable and green growth. Therefore, in its second NDC South Sudan will focus on implementation of GHG mitigation strategies to promote sustainable growth of the sector. These include developing policies to regulate the importation of energy-efficient goods

to reduce the share of embedded emissions, promoting composting of organic waste in the food and beverage industry and promoting the use of alternate sources of energy, such as biofuels and refuse-derived fuel, in energy-intensive industries. As the sector develops, South Sudan will steadily increase the adoption of energy-efficient technologies to reduce energy requirements in industrial processes, as well as increase the share of renewable energy in industrial office and building operations.

### Petroleum, chemical and non-metallic products

South Sudan's economy is largely dependent on oil production, which contributes around 60–80 percent of the country's revenue. However, oil production has declined in recent years as a result of a natural decline in oil reserves and global macroeconomic challenges. Since the sector is of major economic importance, significant efforts are being made by the government to improve its current status. Such efforts include plans to carry out studies to select the best oil wells for increasing oil production. While this sector is not governed by climate-related policies, the petroleum policy calls for environmental protection in the petroleum industry.

As it plays an important role in the economic development of the country, the second NDC will ensure implementation of low-carbon measures in the sector to enable its sustainable growth. To this end, South Sudan will target maintaining its current emission intensity of 8.4 grams of carbon dioxide per megajoule (which is 58 percent lower than the International Energy Agency projection for 2050 with the 2°C scenario). This will be achieved by reducing emissions from flaring (burning) and venting of gas by developing measures to either capture it or reduce the amount of gas flared.

In the long term, South Sudan will consider gradually phasing out the use of petroleum products in favour of alternative sources of energy.

### Health

Currently, access to health care facilities in South Sudan is poor, with a shortage of medical facilities and skilled health workers and limited supplies of medical equipment and drugs. Malnutrition; water-borne diseases; vector-borne diseases, such as malaria; and acute respiratory infections

are common in the country. Increased incidence of water- and vector-borne diseases resulting from climate variability can have severe implications on the already poor health status of the country. The current NDC focuses on strengthening climate-resilient health systems and highlights the need for conducting vulnerability assessments related to human health with future climatic scenarios. The NDS has three-year targets aimed at improving accessibility to health facilities, but it is evident from the current status of the health sector that the country is lagging behind in meeting these targets.

The second NDC will continue to focus on conducting research to understand the relationships between health and climate change. Developing adequate health systems, enhancing early warning systems and developing awareness and capacities of local communities about likely health risks and adequate response measures will also be key aspects of the second NDC.

**Disaster risk management**

South Sudan faces serious risks of floods and droughts, which damage infrastructure and cause food and water shortages. Erratic rainfall, floods and droughts can lead to significant losses of crops and livestock, making communities that are dependent on agriculture and livestock highly vulnerable. The government therefore considers this sector a priority in South Sudan's Vision 2040, NAPA and current NDC. Both the NDC and NAPA focus on strengthening drought and flood early warning systems. The disaster management policy of South Sudan also focuses on implementing preventive measures while strengthening adequate response mechanisms. While the sector is a priority, there seems to be a lack of action in this area, primarily due to a lack of capacity and unavailability of funds in the sector.

The second NDC will continue to focus on developing and enhancing early warning systems by gaining access to international climate finance for building the requisite infrastructure. Means of educating and raising awareness among stakeholders regarding climate risks and response action will also be developed. The second NDC will also focus on building the capacity of communities on response preparedness, especially among women. Furthermore, development of climate-resilient infrastructure will be a key aspect of the second NDC.

## INSTITUTIONAL ARRANGEMENTS

South Sudan has established various policies and plans to ensure sustainable development and management of its natural resources. It has laid down various frameworks to cater for development of the economy while taking into account sustainable development objectives. These policies include the National Environment Policy, Environmental Protection Bill, NAPA, South Sudan National Electricity Policy and Forest Policy, amongst others.

Government organizations that play a lead role in implementing climate change and environment policies in South Sudan include the Ministry of Environment and Forestry, Ministry of Electricity and Dams, Ministry of Water Resources and Irrigation, Ministry of Transport, Ministry of Finance and Economic Planning and Ministry of Humanitarian Affairs, amongst others. Apart from the regulatory bodies and ministries, the implementation of the NDC will also need to involve international donor agencies and regional stakeholders (e.g., educational institutions, non-governmental organizations and private players, such as in industries).

A domestic institutional arrangement has been developed for South Sudan's NDC implementation, describing the roles and responsibilities of all relevant stakeholders, such as ministries, non-governmental organizations, research institutions and private players, in the implementation process. The framework also assigns roles for organizations in key entities (e.g., the National NDC Focal Point, NDC implementing entities,

NDC executing entities, technical assistance and capacity-building agencies, and financing bodies) that will be required to be set up for NDC implementation.

### CAPACITY-BUILDING AND TECHNOLOGY TRANSFER

The Government of South Sudan has identified capacity-building and technology transfer needs that will be required for implementing NDC interventions. As part of capacity-building, South Sudan will need to increase the awareness of individuals, government institutions, communities and other stakeholders on climate change. To this end, the second NDC will support the development of the institutional and technical capacities of government institutions. Moreover, key aspects of the second NDC will include utilizing the capacities of existing research institutions and universities for carrying out climate-related research; developing and implementing awareness raising programmes; and incorporating climate change and topics related to environmental management in school curricula to increase awareness among youth.

Areas where technology transfer will be required in South Sudan include renewable energy; access to climate information systems and technologies to set up hydrometeorological and early warning systems; methodologies and tools for assessing sector-specific climate-related risks; and advanced technologies that support water treatment, recycling and development of climate-resilient infrastructure, amongst others.

### GENDER RESPONSIVENESS OF THE NDC

While women play a crucial role in addressing climate change, they are also disproportionately affected by the adverse impacts of climate change. To reduce the vulnerability of women and to ensure that implementation of climate strategies occurs in a gender-responsive manner, the second NDC will support the integration of gender perspectives into national-level climate-change policies and strategies. South Sudan will target 35 percent representation of women in climate-change decision-making. The second NDC will encourage increased participation of women in climate action, particularly when it comes to adaptation planning in sectors such as agriculture, fisheries and forestry. The second NDC will also ensure that the burden of climate change and opportunities created by climate-change mitigation and adaptation interventions are distributed amongst all genders in an equitable and unbiased manner.

### FINANCING REQUIREMENTS

Access to new and sustained sources of climate finance will play a crucial role in achieving the goals of the Paris Agreement and implementing NDC mitigation and adaptation activities in South Sudan. To enable implementation of interventions that are identified in this NDC document, it is important that South Sudan be provided with opportunities to access technical and financial support from the international community.

It is estimated that South Sudan will require a total of US$100 billion for the implementation of all NDC interventions and strategies over a period of 10 years. Of this, international investments of $93.5–93 billion will be required, while $6.5–7 billion will be financed domestically by the Government of South Sudan. These are preliminary estimates and full-scale assessment of international climate finance needs must still be carried out.

In addition to the support of multi- and bilateral organizations, South Sudan envisages accessing financial, technical and capacity-building support from international climate funds, such as the Green Climate Fund, United Nations Adaptation Fund, Least Developed Country Fund, Global Environment Facility, Clean Technology Fund and Pilot Program for Climate Resilience, amongst others, and financing instruments, such as grants, concessional/non-concessional loans and regional/international carbon markets, amongst others.

# 2 ABOUT **THIS DOCUMENT**

## ABOUT THIS DOCUMENT

This document, the *Republic of South Sudan Second Nationally Determined Contribution*, describes the groundwork done for the development of South Sudan's Nationally Determined Contribution. This document contains the following:

- **National circumstances** (Chapter 3) is a detailed review of the current socio-economic, environmental, geographic, administrative and political situation of the country.
- **Metabolic assessment** (Chapter 4) shows how flows of biomass, fuels, metals, minerals, and water in the country's assets and socio-economic activities interact to support its development. The assessment identifies key sectors that have the potential for supporting the development of a circular and green economy. Key hotspots within each sector are identified for future strategic development. The outputs were used to identify circular opportunities for South Sudan to ensure sustainable extraction of materials, manage existing and future stocks, reduce greenhouse gas (GHG) emissions and air pollution and increase levels of end-of use processing and recycling.
- **Sector prioritization** (Chapter 5) identifies key sectors that should be included in the second NDC document. This exercise was conducted using the results of the metabolic assessment along with a few additional parameters. Based on this exercise, as well as on inputs received from key stakeholders in South Sudan, 14 sectors were identified for inclusion in the NDC. These are:

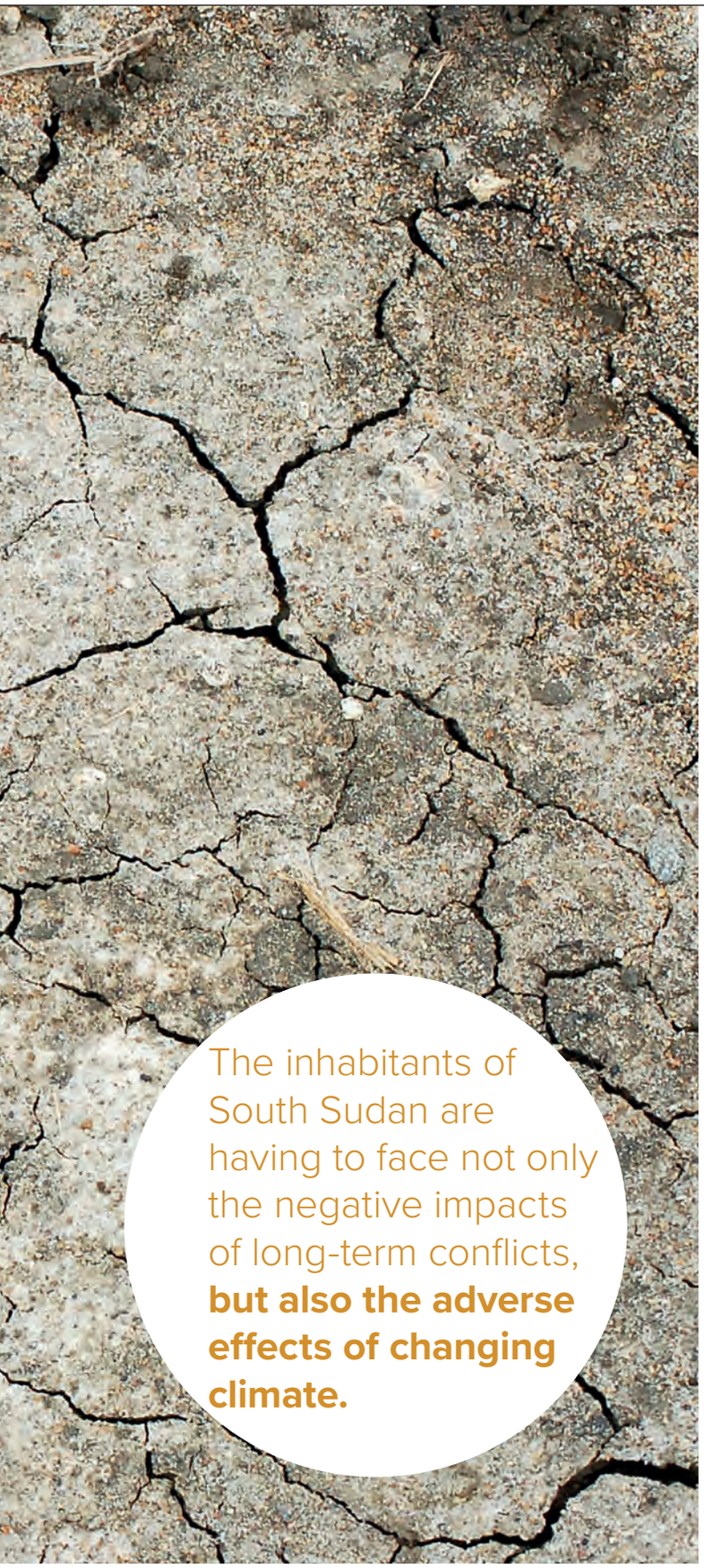
    1. Agriculture, livestock and fisheries
    2. Infrastructure (construction and buildings)
    3. Forestry

4. Biodiversity, ecosystems and sustainable wetland management
5. Electricity
6. Water
7. Waste
8. Tourism and recreation
9. Mining and quarrying
10. Transport
11. Industry
12. Petroleum, chemicals and non-metallic mineral products
13. Health
14. Disaster risk management.

- **NDC sector linkages with Intergovernmental Panel on Climate Change (IPCC) classification** (Chapter 6) is given for the benefit of the reader.
- **Sectoral strategies** (Chapter 7) evaluates progress by sector with respect to the current NDC, strategies and other policies, along with their expected growth trajectory (where possible). This chapter provides sectoral mitigation and adaptation strategies (incorporating circular opportunities identified as part of the metabolic assessment) along with opportunities for each sector to contribute to the development of a circular economy in South Sudan. The timeframe that will be required for their implementation is also included.

- **Institutional arrangements** (Chapter 8) provides a detailed overview of the supporting policies and stakeholders responsible for implementation of policies and programmes related to the environment and climate change. A detailed institutional framework for implementation of the second NDC is included.
- **Capacity-building and technology transfer** (Chapter 9) provides details of the capacity-building needs and technologies that South Sudan will require to implement the interventions and measures included in the second NDC.
- **Gender responsiveness of the NDC** (Chapter 10) provides details of strategies that will be implemented by the Government of South Sudan to ensure that the principles of gender equality are embodied in climate mitigation and adaptation interventions.
- **NDC financing requirements** (Chapter 11) details investments, by sector, required for implementation of proposed NDC mitigation and adaptation strategies (using the financing estimates of the Government of South Sudan for implementation). Financing requirements for additional strategies proposed have also been provided, along with the assumptions and estimation methodology used.
- **International cooperation** (Chapter 12) gives an estimation of the finances that will be required through international cooperation. These are preliminary estimates that will need further detailed analysis and assessment in the years ahead.

# 3 NATIONAL CIRCUMSTANCES



The inhabitants of South Sudan are having to face not only the negative impacts of long-term conflicts, **but also the adverse effects of changing climate.**

# NATIONAL CIRCUMSTANCES

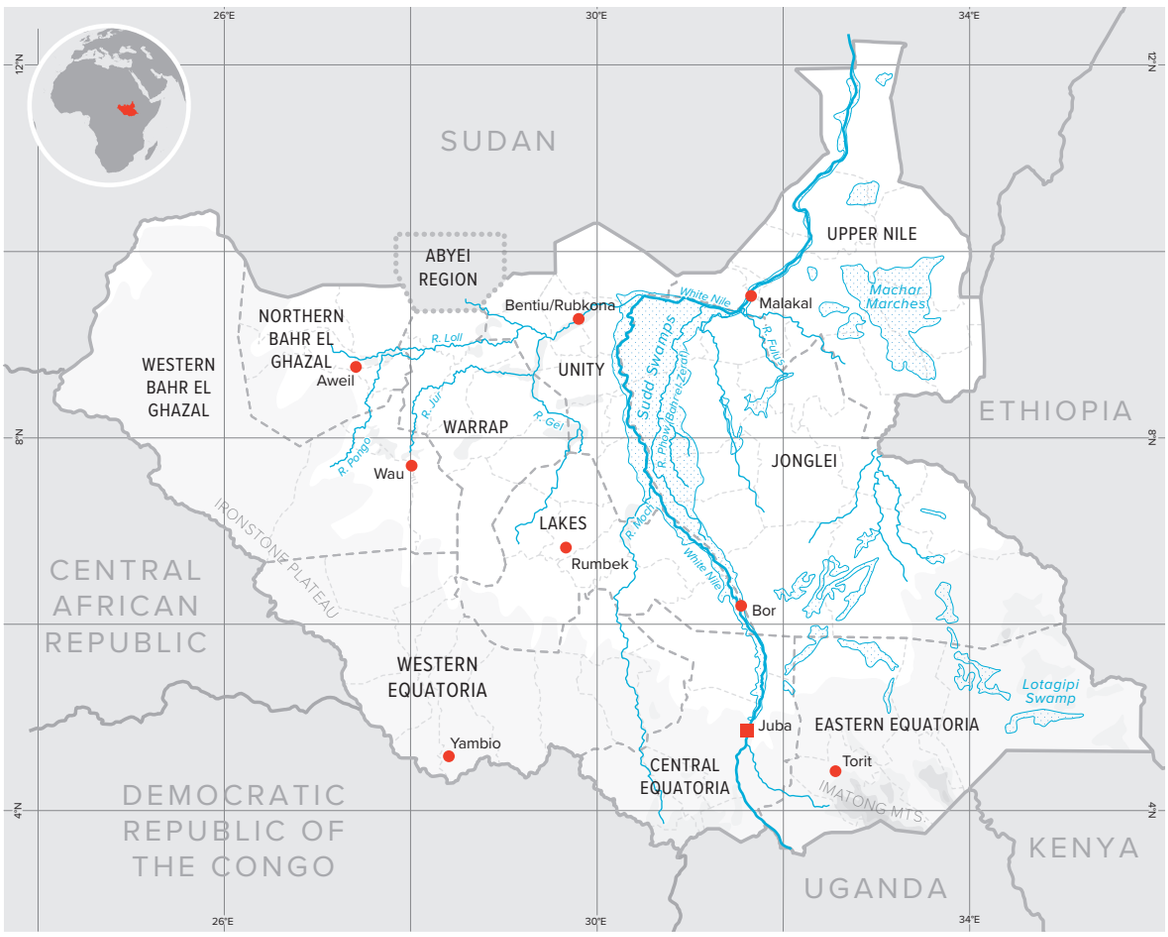
The Republic of South Sudan became a new nation after more than 50 years of civil war that took over three million lives and displaced over a million people. South Sudan gained its independence from Sudan on 9 July 2011 as the outcome of a 2005 agreement and became the 55th country in Africa. The protracted conflict destroyed what little infrastructure and governance structures had existed before the conflict. In December 2013 and July 2016, renewed conflicts undermined the development gains made since independence and exacerbated the humanitarian situation. The gradual implementation of the peace agreement of September 2018, which included establishing a unity government in February 2020 and an agreement on the number of states, gave a positive economic outlook in early 2020 (World Bank, 2020a).

The inhabitants of South Sudan are having to face not only the negative impacts of long-term conflicts, but also the adverse effects of changing climate. The country is facing an increasingly warmer and drier climate with erratic rainfall, resulting in the degradation of ecosystems and decreased agricultural productivity, threatening the livelihoods of a majority of the population. Political and economic instability and limited access to capital, markets, infrastructure and technology, along with changing climate, are hindering the growth of the country.

## 3.1 GEOGRAPHIC PROFILE

South Sudan covers an area of around 619,745 square kilometres and is situated at 7.863 degrees north and 29.695 degrees east (WorldAtlas, 2020). South Sudan is located in eastern central Africa, landlocked by six countries, Sudan to the north, Ethiopia to the east, Kenya to the southeast, Uganda to the south, the Democratic Republic of the Congo to the south-west and the Central African Republic to the west (Figure 1).

**Figure 1: Map of South Sudan**




Disclaimer: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. The final boundary between the Republic of South Sudan and the Republic of Sudan has not yet been determined. The final status of Abyei area is not yet determined.

South Sudan's landscape includes extensive grassland, swamps and tropical rainforest, which stretches along both banks of the Nile River. The Nile River system is the dominating physical feature of the country. It runs from south to north through the country joined by its major tributaries, the Bahr el Ghazal, the Bahr al-Arab and the Sobat. The centre of the country is dominated by the Sudd wetland, a large swampy area occupying the heart of South Sudan. It is one of the largest freshwater ecosystems (wetland) in the world, incorporating an area of approximately 57,000 square kilometres. The wetland is rich in biodiversity and around one million agropastoralists inhabit the area (United Nations Educational, Scientific and Cultural Organization (UNESCO), 2017). Two distinct highland areas exist in the country. Along South Sudan's border with Uganda is the Imatong Mountain Range, which includes the country's highest peak, Mount Kinyeti, which is 3,187 metres (10,456 feet) above sea level. Another elevated portion of the region, the Ironstone Plateau, is between the clay plain and the Nile-Congo watershed, to the west and south of South Sudan. With suddenly rising isolated hills called inselbergs, this area features relatively flat elevated land.

The country lies entirely within the Nile River basin, which makes its land suitable for agriculture. Around 75 per cent of the country's land area is suitable for agriculture, where an area of approximately 330,000 square kilometres is estimated to be fit for cultivation. In spite of more than 50 percent

of its land mass being prime agricultural land, only 5 percent of this land is currently cultivated continually or periodically. Thirty-four percent of the national cropland is located in the western flood plains. The greenbelt and eastern flood plains are the other two important crop production regions, accounting for 18 percent and 26 percent of national cropland, respectively.

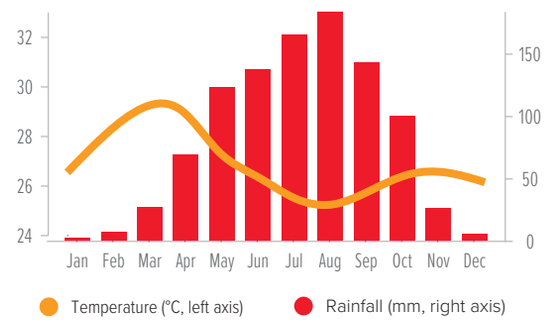
In South Sudan, the major portion of land is under forest cover. In 2012, the South Sudan Government reported that 405,629 square kilometres of land was covered by forest, which represented 62.6 percent of South Sudan's total national land area (United Nations Environment Programme (UNEP), 2018a). The local communities use the forests to extract timber for construction purposes, fuelwood for cooking and making charcoal and non-timber forest products like food, medicines, oil, gum and resin for their daily needs. With increasing population, the forests of South Sudan are degrading as a result of factors that include continual use of wood for cooking, seasonal burning of forests by pastoralists to regenerate pastures and conversion of natural forest into urban or rural settlement areas. The large-scale degradation of forest areas has resulted in soil erosion, loss of biodiversity and altered hydrological and nutrient cycles.

South Sudan is vulnerable to many natural disasters, the most common being weather-related disasters, such as floods, droughts, heatwaves, outbreaks of disease and earthquakes. In recent years, all these threats have been exacerbated by climate change, which is increasing in terms of severity, frequency, and complexity, leaving behind trails of infrastructure destruction, human suffering and loss of livelihoods (ReliefWeb, 2017).

### 3.2 CLIMATE AND CLIMATE CHANGE IMPACTS

The climate of South Sudan is predominantly tropical savannah, although there is a warm semi-arid climate in the far northern and south-eastern areas. The country has a high rainfall season, followed by a drier season. The single long rainy season lasts from March to November,

**Figure 2: Average monthly temperature and rainfall in South Sudan, 1901–2016**

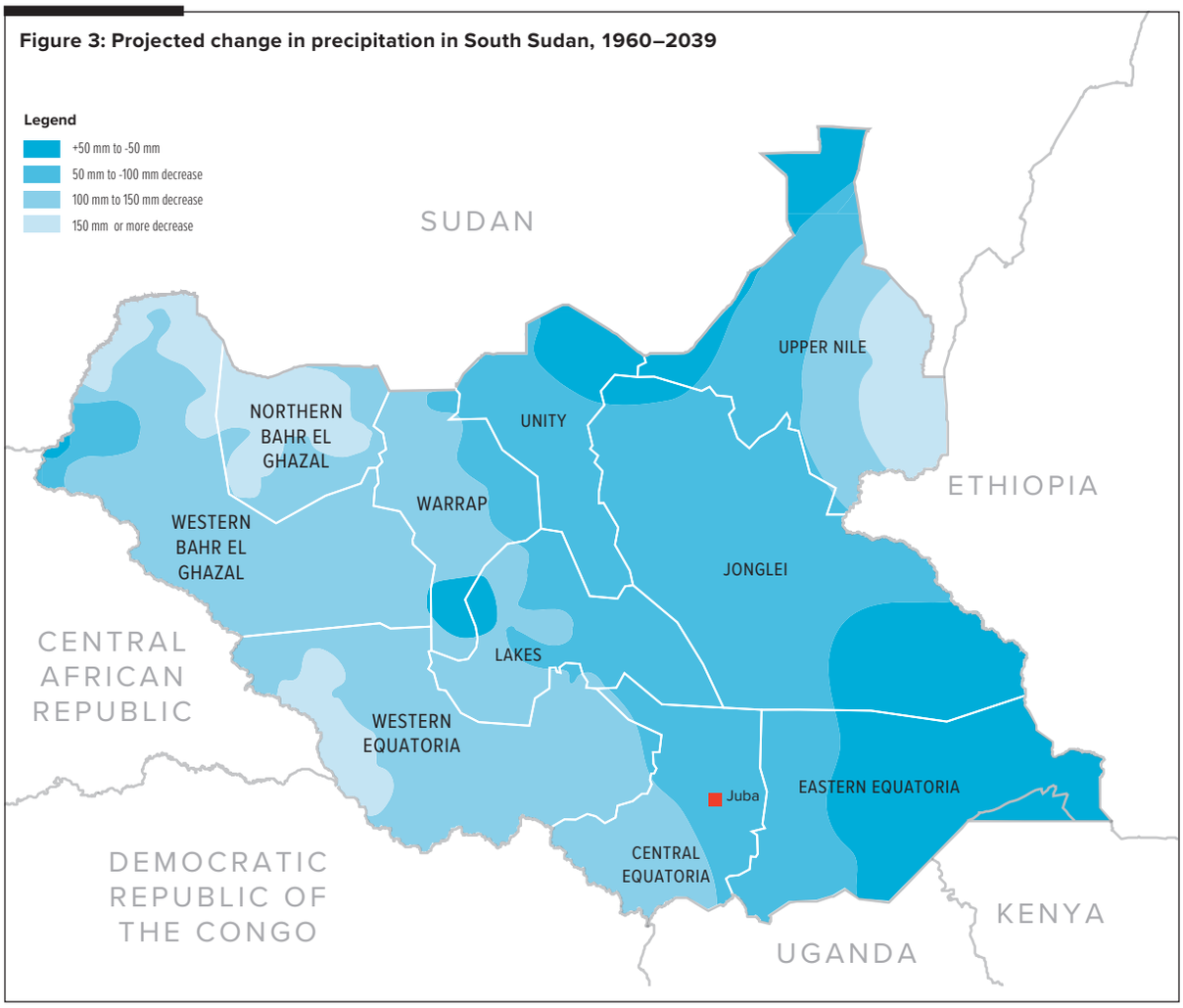



Source: World Bank Climate Change Knowledge Portal

and peaks from May to September, leading to seasonal flooding (Figure 2). The rainfall regions of South Sudan stretch outside the country's border into Ethiopia to the east, Sudan to the north and Uganda to the south (African Development Bank (AfDB), 2018). Annual rainfall ranges from 200 millimetres in the southeast to 1,200–2,200 millimetres in the forested areas in Western Equatoria and the Equatorian highlands. In the northern states, rainfall varies between 700 and 1,300 millimetres (United States Agency for International Development (USAID), 2016).

Historical data of rainfall show that the highest rainfall occurs in the southwest and is lowest in the northeast, especially in the greenbelt along the border with the Central African Republic, the Democratic Republic of Congo and Uganda. Climate change has considerably impacted the rainfall pattern in terms of temporal and spatial variation within the same year due to bimodal and unimodal rainfall regimes (The Netherlands Ministry of Foreign Affairs, 2018). The country has been experiencing a 10–20 percent decrease in long rains since the mid-1970s. As a result, the area of regions receiving adequate rainfall of over 500 millimetres to support the livelihoods of agropastoralists has been reduced by 18 percent (ibid.). Furthermore, future rainfall projections for the years 2010–2039 show reductions of over 150 millimetres in rainfall between June and September in some parts of the country (Figure 3) (The Netherlands Ministry

**Figure 3: Projected change in precipitation in South Sudan, 1960–2039**



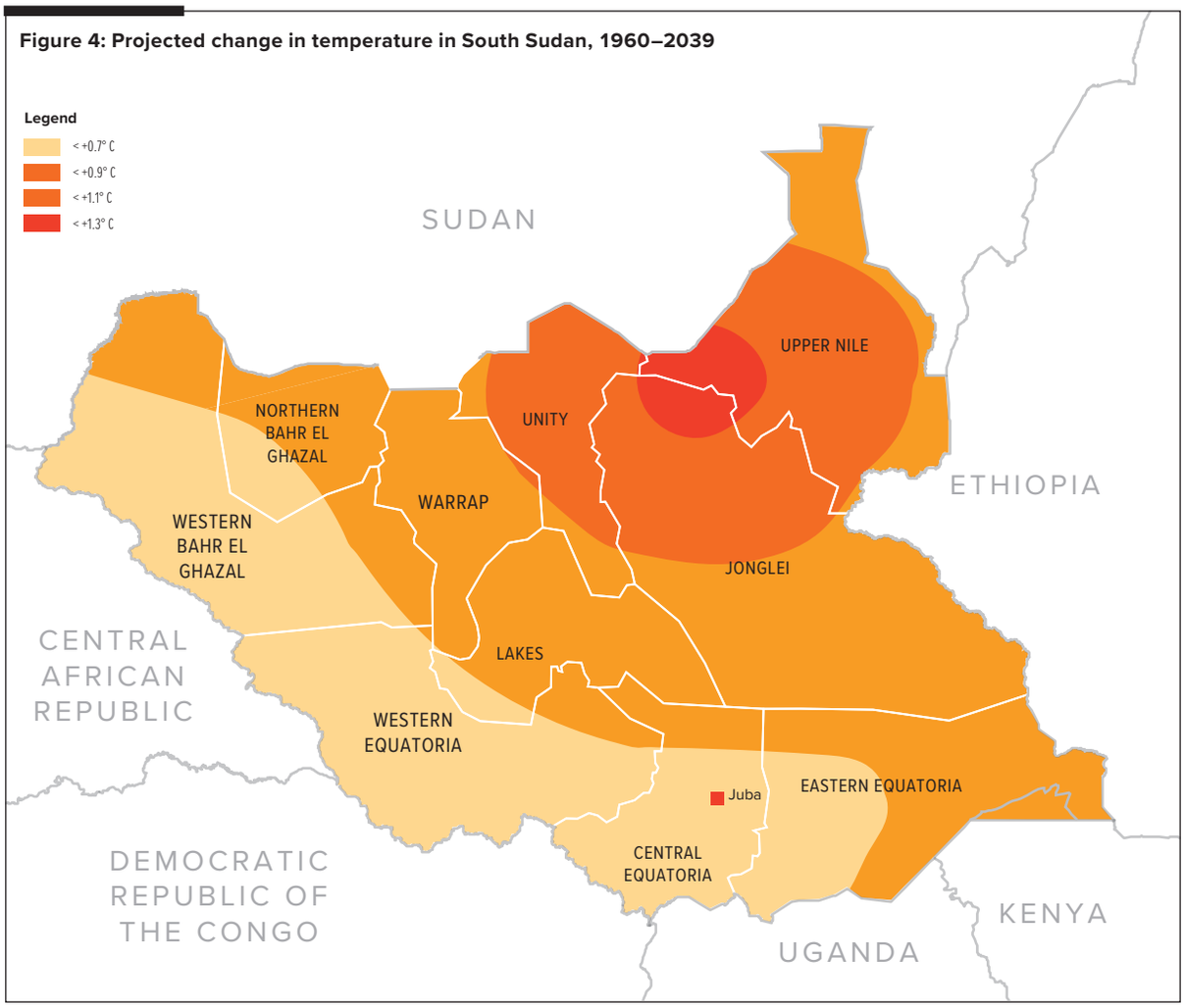

Source: UNEP, 2018a

of Foreign Affairs, 2018; UNEP, 2018a). This will exacerbate negative impacts on communities dependent on climate-sensitive sectors such as agriculture and fishing for their livelihoods.

In the last 30 years, South Sudan has been among the most rapidly warming countries globally, with an increase in temperature of as much as 0.4 degrees Celsius (°C) per decade, especially in the central and southern regions (Figure 4) (South Sudan Ministry of Environment, 2018). General circulation model projections indicate that temperatures may increase by 0.6–1.7°C by 2030 and by 1.1–3.1°C by 2060 relative to the baseline period of 1961–1990 (ibid.). A simultaneous decrease in precipitation and increase in temperature will amplify the impact of droughts; warming of more than 1°C is equivalent to another 10–20 percent reduction in rainfall through increased evaporation, which would further reduce the availability of water (The Netherlands Ministry of Foreign Affairs, 2018). People are distressed by both droughts and floods, which respectively affected approximately 7,900,000 and 1,140,000 people during the period 1996–2016 (AfDB, 2018). If current rainfall trends continue, the drying impacts could extend into Western and Northern Bahr al Ghazal, Warrap, Unity, Al Buhairat (Lakes) and Central Equatoria by 2025 (Niang et al., 2014; Funk et al., 2011).

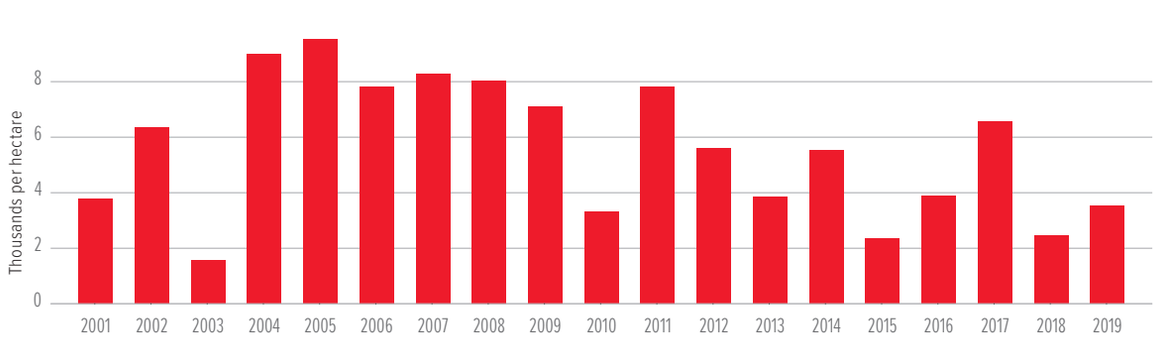
Most of the agriculture in South Sudan is rainfed and therefore depends on seasonal rainfall for optimal crop production, making the sector vulnerable to climate variability. Extended dry seasons (droughts) and increasing precipitation variability negatively impact the economy and the nutrition status

**Figure 4: Projected change in temperature in South Sudan, 1960–2039**



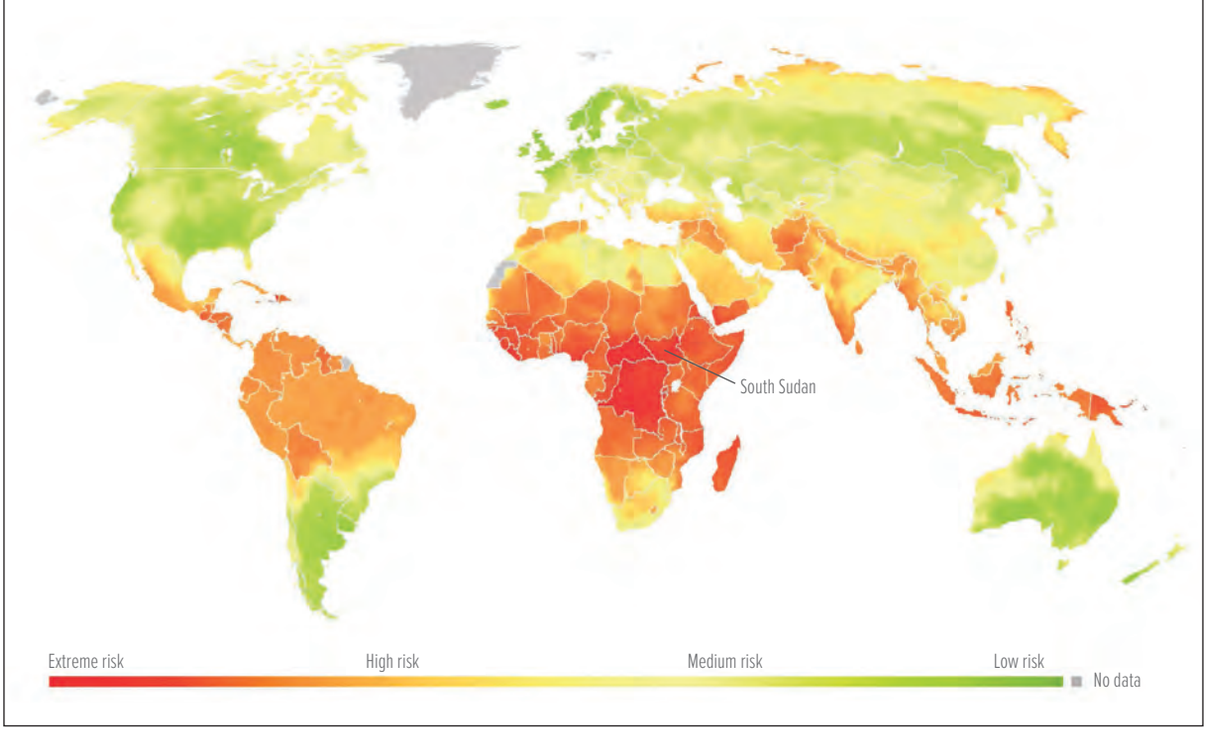

Source: UNEP, 2018a

**Figure 5: Reduction in tree cover, 2001–2009**




Source: Global Forest Watch, 2020

**Figure 6: Climate Change Vulnerability Index, 2017**




Source: Verisk Maplecroft, 2017

of residents who rely on agriculture for their livelihoods. According to Taha et al. (2013), there is likely to be a reduction in sorghum production, one of the staple grains of most of the population, by 5–25 percent between 2000 and 2050.

From 2001 to 2019, South Sudan has also witnessed a loss of around 12.3 square kilometres of relative tree cover, equivalent to an average annual decrease of 2 percent since 2000 (Figure 5) (UNEP, 2018a; Global Forest Watch, 2020). The major drivers for deforestation are commodity-driven deforestation, shifting agriculture and an increase in demand for fuelwood and charcoal (UNEP, 2018b). A study by Salih et al. (2013) in South Sudan suggests that reduction in vegetation cover significantly affects precipitation and surface temperature. The study further proposes that the impact of precipitation reduction is not only local but will also extend to central Sudan and neighbouring regions, suggesting that deforestation has both local and wider regional climatic impacts.

As South Sudan is one of the world's newest countries, there is little current and historical data available; consequently, the country is either not included at all or is included with Sudan for international assessments and reports. One such assessment index is the Notre Dame Global Adaptation (ND-Gain) Index. Sudan (including South Sudan) was ranked 176th out of 181 countries, inferring it to be extremely vulnerable and the 14th least ready country to combat climate change effects.

In 2017, the Verisk Maplecroft Climate Change Vulnerability Index (CCVI) (2017) included South Sudan independently in the assessment and ranked it 5th out of 191 countries with regard to climate change vulnerability (Figure 6). The CCVI evaluates the sensitivity of populations, the physical exposure of nations and governmental capacity to adapt to climate change over the next 30 years. Its rank conveys that South Sudan is likely to witness significant economic impact due to climate change in the future.

## 3.3 ENVIRONMENT AND NATURAL RESOURCES

There is an abundance of water, forest and mineral resources in South Sudan. The Nile River is the dominant feature and includes Africa's second-largest wetland, the Sudd, and East Africa's largest intact savannah ecosystem. The swamps, floodplains and grasslands of South Sudan contain rich biodiversity of flora and fauna (LandLinks, 2013).

The protected areas of South Sudan include wildlife, forests and Ramsar sites.[3] The country has an extensive system of game reserves, some of which date back to the 1930s, and national parks. In total, South Sudan's protected area occupies approximately 87,030 square kilometres, which is about 13 percent of the country's surface. It is estimated that national parks cover an area of 51,760 square kilometres, game reserves cover 34,110 square kilometres, and forest reserves cover 1,160 square kilometres (South Sudan Ministry of Environment, 2015).

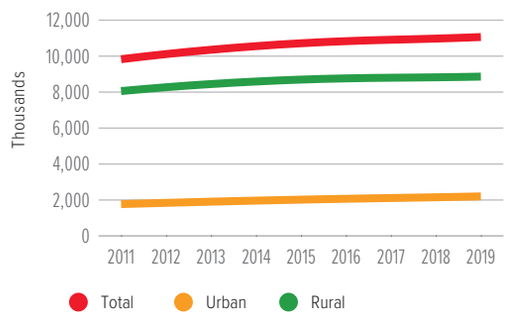
The wide variety of ecosystems in the country supports a very diverse range of animals and plant species. Some of the country's endemic fauna include the Nile lechwe (*Kobus megaceros*), Hoogstral's striped grass mouse (*Lemniscomys barbarus*), Nile sitatunga (*Tragelaphus spekii spekii*) and *Dendromus ruppi*. In Africa, South Sudan is considered to be the only country with both eland species – the common eland (*Taurotragus oryx*) and the Lord Derby (or giant) eland (*Taurotragus derbianus*). The Imatong Forest, one of the most extensive intact podocarp forests in Africa, is a significant biodiversity hotspot that supports over 2,000 vascular plants and 500 bird species. Other endemic fauna include *Barbus tongaensis*, *Chloroselas taposana* and *Lepidochrysops nigritia*. *Aloe diolii*, *Aloe macleayi*, *Encephalartos mackenziei* (a cycad), *Chlorophytum superpositum*, *Scilla chlorantha* and *Panicum bambusiculme* are amongst the vascular plant species restricted to South Sudan. Flora and fauna are an invaluable natural resource and could attract significant tourism to the country in the future.

Along with diverse biodiversity, South Sudan is also rich in mineral resources. The primary mineral resources are (Owuor, 2019):

- **Petroleum:** Around 85 percent of Sudanese oil was produced by South Sudan before it became independent from Sudan. Crude oil accounts for 98 percent of the total revenue generated by the country and it is estimated that South Sudan has oil reserves of 428.2 million tonnes. In 2019, it produced 140,000 barrels per day, and it is predicted to pump 350,000 barrels per day by the end of next year. The Bentiu field is rich in oil, and there are potential reserves in areas such as Warrap and Jonglei.
- **Marble/dolomite:** There are several marble deposits in the Kapoeta region, totalling about 7.3 million tonnes. The largest deposit is located approximately 4 kilometres northeast of Kapoeta town. Marble deposit consists of 52.6 percent calcium oxide, 0.8 percent magnesium oxide, potassium oxide, and nitrogen oxide. Several dolomite deposits were also recorded in large quantities in the district of Torit. These deposits are suitable for processing and manufacturing cement, fertilizer, glass, and flux.
- **Aluminium:** The exact extent of the country's aluminium reserves is not known, but is estimated to be significant, at approximately 9.1 million tonnes. Deposits are found up to the Democratic Republic of the Congo border in conflict zones such as Juba, Raga-Wau-Rumbek and Yambio. Weak road networks and conflicts have constrained access to some of these regions.
- **Iron ore:** Deposits of iron ore are found in a broad area stretching from Yambio to the area bordering South Darfur. The highest concentration (8 percent) is found in the Wau area. Deep deposits in the Wau–Raga area

3 A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention.

**Figure 7: Population growth of South Sudan**




Source: World Bank, 2020

cover approximately 80,000 square kilometres, with iron ore concentrations varying from 22 to 90 percent. Because of the lack of adequate facilities and disputes, the mineral ore remains mostly untapped.

- **Gold:** The eastern portion of South Sudan, which includes Anakanak, Nyangea, Karomi, Lauro and Buno, has gold deposits. While the principal source of income for people in the Kapoeta district is gold mining, the nation as a whole does not profit significantly from it because of ongoing disputes that have impeded exploration work.

## 3.4 SOCIO-ECONOMIC CHARACTERISTICS

Around 78 percent of households earn their living from agriculture, fishing and pastoralism, or a combination of the three. Farming is mostly rainfed, and farmers use handheld tools to cultivate their small plots. Pineapple, cotton, groundnuts, sorghum, millet, wheat, cotton, sweet potatoes, mangoes, pawpaw, sugarcane, cassava and sesame are some of the commonly-grown agricultural products. Around eight million cattle are owned by pastoralists, and there are millions of chickens, goats, pigs, horses, donkeys and sheep (UNEP, 2019).

### 3.4.1 Population

In 2019, the total population of South Sudan was 11,062,113. Over the past five years, the rate of population growth rate has been slow (1 percent per year). The country experiences national conflicts, communal clashes and natural disasters, leading to internal displacement and migration of people to other countries, like Sudan, Ethiopia, Kenya, and the Democratic Republic of the Congo (United Nations High Commissioner for Refugees, 2020). Since 2014, 15 percent of the people have been internally displaced, primarily because of natural disasters exacerbated by changing climate (Migration Data Portal, 2020).

Most of the population is rural (8,860,863), and the urban population is relatively small (2,201,250) (Figure 7) (World Bank, 2020c). Approximately 95.6 percent of urban residents live in slum settlements (AfDB, 2018).

The gender ratio is 52 percent male to 48 percent female. The population is primarily young, with 72 percent of the total population being under 30 years of age (World Life Expectancy; South Sudan National Bureau of Statistics).

A young population can play a pivotal role in transforming societies for a climate-resilient future. Youth have an important part to play in raising environmental awareness, promoting sustainable lifestyles, adopting environment-friendly practices and conserving nature and its resources. South Sudan can encourage its youth to work towards creating an environmentally sustainable and climate-resilient society.

### 3.4.2 Health

South Sudan has a poor World Life Expectancy ranking of 173, with the life expectancy of males and females being 57.7 and 59.6 years, respectively. As per World Life Expectancy 2020 data (World Bank, 2020c), the predominant reasons for death in South Sudan are HIV/AIDS, influenza and pneumonia, and diarrhoeal diseases (Table 1).

Gradual climate changes that affect the quality of water, food and air also have a negative effect on human health across the globe (World Bank Climate Change Knowledge Portal). The human health sector has strong ties to climate change,

by means of both direct exposure and indirect pathways. Extreme climate events, such as heat waves, hurricanes and storms, floods and droughts, have direct detrimental health impacts, whereas climate change and global warming have indirect effects on infectious and vector-borne diseases. Diarrhoea and malaria are among the top five causes of deaths in South Sudan (Table 1), and these are likely to increase under the influence of climate change.

South Sudan also has the world's highest maternal mortality rate; 1 in 7 women die from childbirth or pregnancy. Infant mortality rates are also exceptionally high, with 75 children per 1,000 dying before their first birthday (CARE, 2020). It is believed that climate change will further increase infant and maternal mortality and birth complications and exacerbate poor reproductive health in tropical developing countries. In particular, the effect of infectious diseases, extreme environmental conditions, malnutrition and heat exposure will lead to serious health risks for mothers and children (Rylander et al., 2013). Thus, the overall impact of climate change on the population of South Sudan will be detrimental as it will lead to extreme weather events, increased infectious diseases and poor maternal and child health.

### 3.4.3 Education

South Sudan has one of the lowest literacy rates in the world. The education system consists of around 8,000 primary schools (Grades 1–8), about 120 secondary schools (Grades 9–12) and only one university (Global Partnership for Education, 2020). According to USAID, although the number of school enrolments has increased to 1.4 million from 300,000 in the year 2000 there are still 1 million children out of school. The same source highlights an acute shortage of trained qualified teachers, with the ratio of pupil to qualified teachers being 100 to 1.

It is estimated that only around 8 percent of women are literate, possibly the lowest female literacy rate in the world (USAID, 2012). Women in poor and developing countries are affected by the adverse

**Table 1: Leading causes of death in South Sudan**

| Cause of death | Historical average (until December 1, 2020) |
|---|---|
| HIV/AIDS | 12,141 |
| Influenza and pneumonia | 11,674 |
| Diarrhoeal diseases | 9,623 |
| Birth trauma | 5,371 |
| Malaria | 4,821 |
| Low birthweight | 4,634 |
| Coronary heart disease | 4,621 |
| Stroke | 3,803 |
| Road traffic accidents | 3,524 |
| Maternal conditions | 3,034 |
| Meningitis | 2,733 |
| Tuberculosis | 2,645 |
| Leishmaniasis | 2,472 |
| Malnutrition | 2,467 |
| Syphilis | 2,196 |
| Tetanus | 1,755 |
| War | 1,608 |
| Diabetes mellitus | 1,504 |
| Lung disease | 1,018 |
| Hypertension | 826 |
| Alzheimer's disease and dementia | 750 |
| Cervical cancer | 715 |
| Drowning | 702 |
| Breast cancer | 657 |
| COVID-19 | 61 |

Source: World Life Expectancy

effects of climate change because of their limited capacity to adapt. For various reasons, women are more vulnerable to climate change than men, including illiteracy, few socio-economic skills, poor access to assets, social isolation, limited access to decision-making and few economic assets (United Nations WomenWatch, 2009). Similarly, women in South Sudan are at the bottom of the social hierarchy, which creates imbalances that leave them highly exposed to climate change disasters. They are less resilient, rely more on natural resources, and have a high rate of illiteracy, few skills and inadequate access to professional employment. This makes them more vulnerable than men to climate change disasters, and households headed by women are more susceptible (Mai et al., 2018). However, women can make a significant contribution to climate change adaptation and mitigation if empowered.

Education services are also impacted by climate change. Flooding in South Sudan impacts around 60 percent of the country and persists for half a year (South Sudan Ministry of General Education and Instruction, 2018), and seasonal flooding severely impacts the functioning of the schools and colleges. The South Sudanese education system faces several challenges, which include limited government funding, low teacher remuneration, inadequate numbers of qualified teachers, inadequate school infrastructure and gaps between policy formulation and implementation.

The World Bank's education status report (2012) highlights the demand for education among people, which would require more educated citizens to support these efforts in the country.

### 3.4.4 Economy

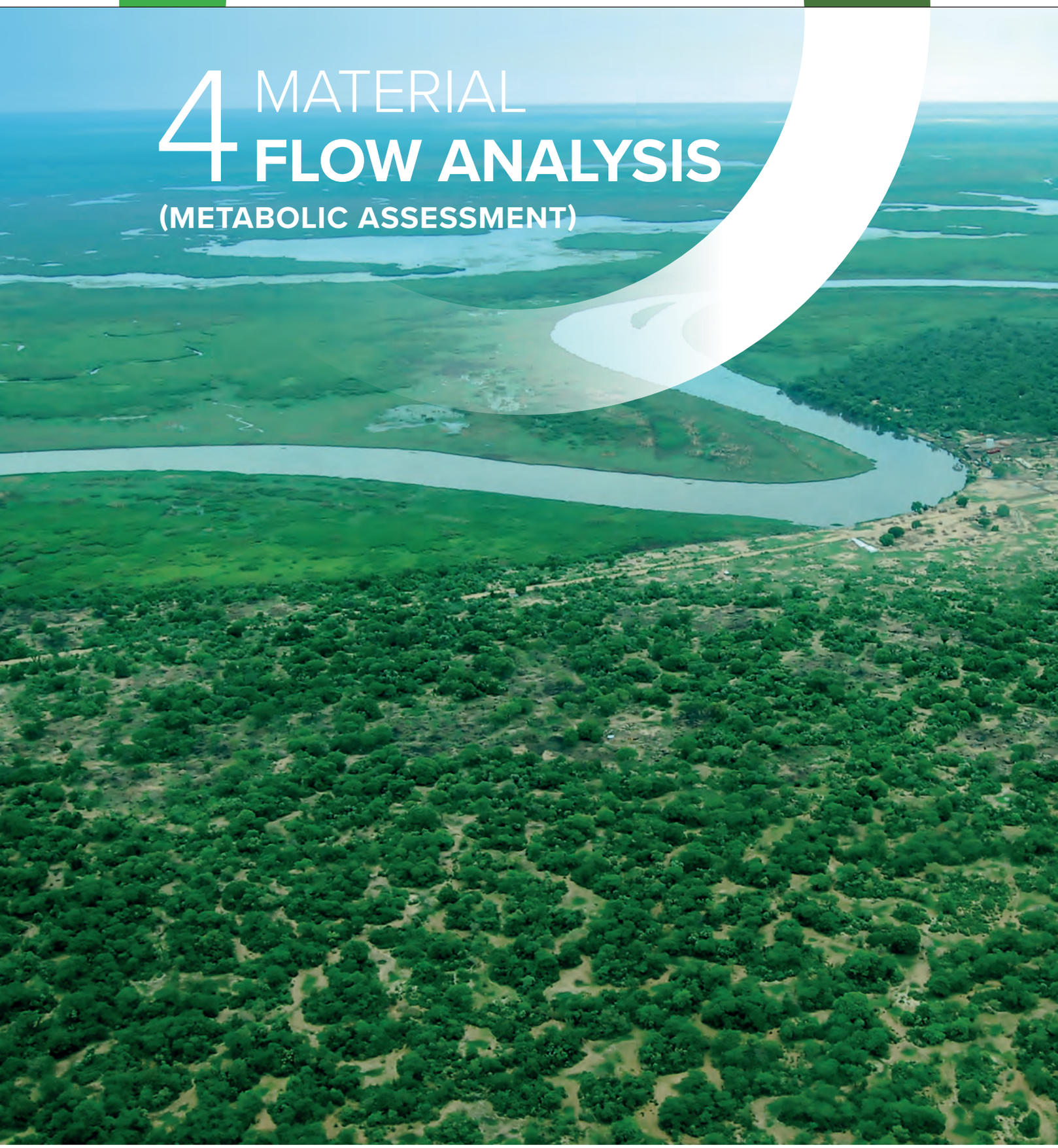
Petroleum is the lifeblood of the South Sudanese economy, followed in importance by services and agriculture (AfDB, 2020). Oil alone accounts for more than half of the total gross domestic product (GDP), 95 percent of exports, 90 percent of government revenues and a significant share of private sector employment (Food and Agriculture Organization (FAO), 2020b). Although South Sudan engages in primary fossil fuel production, it does not have an active refinery to manufacture secondary petroleum products, and the majority of the produced crude oil is exported.

The country's GDP per capita dropped from $1,111 in 2014 to less than $200 in 2017 (World Bank, 2020a). In 2019, GDP growth was estimated to be 5.8 percent compared to 0.5 percent in 2018; recovery of the economy was driven by the reopening of oil fields and resumption of

production after the peace agreement was signed in September 2018. These statistics highlight the dependence of South Sudan's economy on its output of petroleum. However, adoption of climate change mitigation measures will influence the global energy consumption pattern, which will affect the economy of the nation. Climate policies and measures supported by the Kyoto Protocol and subsequent negotiations will see a reduction in the consumption of crude oil in developed countries, leading to a decline in global oil demand. The combination of demand shocks driven by energy efficiency, substitution effects driven by renewable energy subsidies and market distortion driven by carbon tax may affect oil prices in the long term. With such uncertainties linked to the crude oil market, the oil-dependent economy of South Sudan is particularly at risk.

Livelihoods outside the oil sector are concentrated in unpaid agriculture and pastoralism with low productivity. The nation also has about 38 million cattle, goats and sheep, which provide livelihoods to around 80 percent of the inhabitants (USAID, 2016). Based on the international poverty line of $1.90 a day in 2011 purchasing power parity, approximately 82 percent of the population in South Sudan is poor (World Bank, 2020a). Poverty is intricately related to vulnerability to climate change, reducing capacity to adapt and mitigate its consequences. Poor people have limited access to water, food, infrastructure, health, housing, livelihood and services, and their situation is predicted to worsen under future climate change scenarios. Therefore, limited resources and poverty are likely to increase local conflicts for sustenance among the population.

Thus, South Sudan's economy is exposed to various climate change challenges, including changing weather, fluctuating oil prices and local conflicts for resources. Recognizing this, and to achieve sustainable economic development, South Sudan aims to transition from a least developed country to a middle-income country by 2040, supported by inclusive, stable and sustainable economic growth, while alleviating poverty. The promotion of environmental sustainability, climate-resilient communities and appropriate land use has been identified as a critical enabler that will complement the eight strategic priorities of the NDS 2018–2021. To accomplish this goal, South Sudan has developed multiple sectoral policies and plans. In addition, through this report, it now presents its second NDC, setting out the next generation of targets with the overarching goal of transitioning to a low-carbon economy by 2030.



# 4 MATERIAL FLOW ANALYSIS (METABOLIC ASSESSMENT)

To carry out the assessment, various public data sources were used, **particularly the SCP-HAT.**

## MATERIAL FLOW ANALYSIS (METABOLIC ASSESSMENT)

Decoupling economic growth from environmental pressures requires a combination of low-carbon development and resource-use efficiency. To achieve resource-use efficiency, it is important to understand how resources flow within an economy to produce goods and services (Circle Economy, 2020). Mapping the flows and stocks of a country helps us understand and identify resource- and energy-intensive hotspots that can be transformed to increase efficiency and improve the performance of the overall economic system.

The metabolic assessment (i.e., material flow analysis) detailed in this report is intended to help the reader understand how flows of biomass, fuels, metals, minerals and water in South Sudan's assets and socio-economic activities interact to support the development of the country. To carry out the assessment, various public data sources were used, particularly the United Nations' Sustainable Consumption and Production Hotspot Analysis Tool (SCP-HAT). The tool uses national-level environmental and social data, along with trade information, to provide information on environmental pressure and impact indicators.

The metabolic assessment was conducted using the following steps:

1. **Extraction of data on South Sudan's economy from SCP-HAT**

- **Perspectives:** The tool provides data on numerous socio-economic and environmental parameters, such as raw material consumption, GHG emissions, air pollution, land and biodiversity, from two different perspectives. These are:
    - **Domestic production**, which helps in understanding the pressures and impacts from production of material for the purpose of domestic consumption and export.

- **Consumption footprint,** which helps in understanding the pressures and impacts from consumption of material (domestic and imported).

- **Key terminologies:** Key parameters used for input-output analysis for each sector were understood to assess their usage for the purpose of sector assessment and prioritization. These terminologies were studied through resources on the SCP-HAT website, as well as the sources referred to for development of the SCP-HAT methodology, such as the Eurostat Economy-wide Material Flow Accounts and System of Environmental-Economic Accounting 2012. These parameters have been defined for further reference (Table 2).

- **Sector classifications:** All 24 economic sectors in SCP-HAT were studied to understand what has been included under each sector. These sectors include agriculture and livestock; fishing; mining and quarrying; food and beverages; textiles and wearing apparel; wood and paper; petroleum, chemical and non-metallic mineral products; metal products; electrical and machinery; transport equipment; other manufacturing; recycling; electricity, gas and water; construction; maintenance and repair; wholesale trade; retail trade; hotels and restaurants; transport; post and telecommunications; financial intermediation and business activities; public administration; education, health and other services; and private households.

  The International Standard Industrial Classification of All Economic Activities Revision 3 was studied to provide an understanding of the components within each sector (e.g., understanding whether petroleum extraction has been classified under mining and quarrying, or petroleum, chemical and non-metallic mineral products).

- **Data:** Datasets for all sectors were extracted from SCP-HAT Module 2 for further analysis. The parameters used under both the perspectives for further assessment include:
  - raw material use
  - climate change short term
  - employment (men and women)
  - output/final demand.

- **Data sources and availability:** All data sources referred to in the SCP-HAT were further explored to assess availability of the latest information. It was found that the most recent information was for 2015.

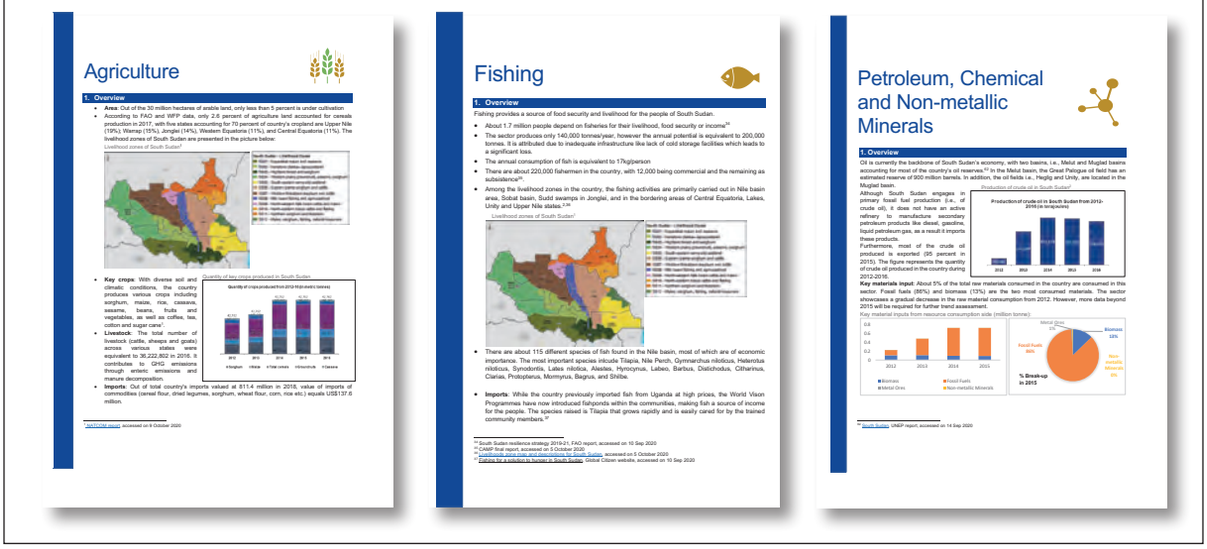
2. **Review of the current status of South Sudan's economy from the perspective of climate change.** A detailed review of all sectors was conducted to gain an understanding of their status, vulnerability to climate change, GHG emissions profile, current NDC alignment, existing policies and strategies and key stakeholders involved in the sector.

   Sector briefs were developed for each individual sector (Figure 8). The sector briefs include an information gap analysis that lists the datasets that are currently not available publicly. The

**Table 2: SCP-HAT parameters**

| Parameter | Definition |
|---|---|
| Climate change short term – GHG emissions | Shorter-term environmental and human health consequences from the rate of temperature change with global warming potential within 100 years (SCP-HAT, 2019).<br>This information has been used to understand the key hotspots within each sector and sector efficiency, as well as substitutes for assessing growth of the sector (where trends are unavailable). |
| Output | Value produced by sectors in the national economy (United Nations, 2014) |
| Final demand | Value of products consumed (produced domestically and/or exported) within South Sudan (ibid.) |

**Figure 8: Sector briefs**




country will start monitoring and reporting on these, enabling it to successfully track the implementation of various sectoral climate measures.

3. **Use of information and data gathered to map material flows within South Sudan's economy.** The data for each parameter for all sectors for the year 2015 were used from SCP-HAT, along with other publicly available data, to conduct a detailed metabolic assessment which provides details on national as well as sector resource use and GHG emissions trends.

The following sections provide the outcomes of the assessment.

## 4.1 NATIONAL TRENDS AND DEVELOPMENT

The United Nations country classification identifies South Sudan as being among the lowest developing countries in the world. The country declared its independence from Sudan in July 2011, following six years of autonomy and 20 years of war. Industry and infrastructure in South Sudan are currently underdeveloped and people live in extreme poverty as a result of several decades of civil war with Sudan. In 2019, the population of South Sudan was 11,062,113, with the majority of the people (80 percent) living in rural areas. Of the small urban population, a majority (95 percent) live in slum settlements (AfDB, 2018). The country has had an annual population growth rate of 1 percent over the past five years.

The country's GDP per capita dropped from $1,111 in 2014 to less than $200 in 2017 as a result of a decline in oil production. With the resumption of oil production in 2017, the economy started to recover, showing a GDP growth of 0.5 percent in 2018, which further increased to 5.8 percent in 2019 (World Bank, 2020a).

In 2018, the country imported goods worth $811 million while exports were valued at $1.71 billion, representing a trade surplus of $1.46 billion (Observatory of Economic Complexity). While the country's key suppliers are China, Uganda, Kenya, the Netherlands, Thailand, Pakistan, the United States of America and Germany, it primarily exports goods to China, Pakistan, India, the United Arab Emirates, Uganda and Germany.

- **Exports:** The top exports of South Sudan are crude petroleum ($1.63 billion), forage crops ($32.1 million), raw cotton ($13.8 million), gold ($12.4 million) and dried legumes ($9.98 million), exported mainly to China ($1.59 billion),

the United Arab Emirates ($48.3 million), India ($44.4 million), Pakistan ($24.2 million) and Uganda ($3.19 million) (Observatory of Economic Complexity).

- **Imports:** The top imports of South Sudan are motor cars ($60.2 million), raw sugar ($51.4 million), delivery trucks ($43.8 million), cereal flours ($36.3 million) and palm oil ($28.2 million), importing mostly from Uganda ($301 million), the United Arab Emirates ($162 million), Kenya ($128 million), China ($76.7 million) and the United States of America ($21.7 million) (ibid.).

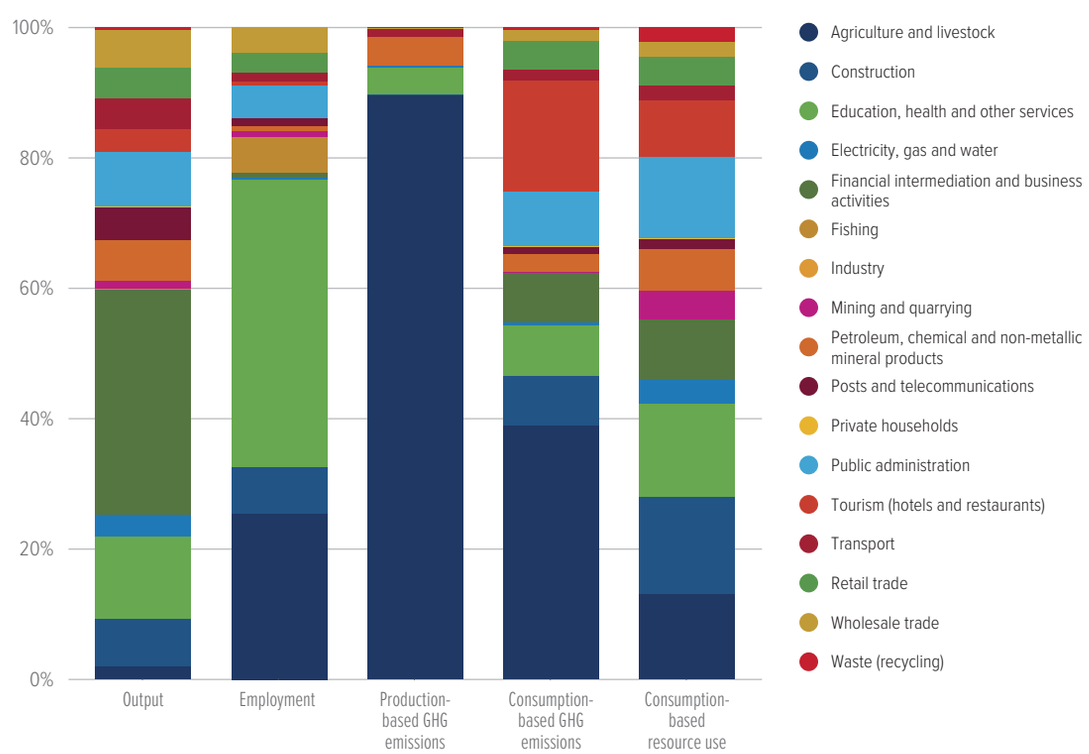
Apart from oil, other sectors that are important for South Sudan's growth are agriculture and livestock, industry, infrastructure, tourism, health and education.

Petroleum and agriculture contribute the most to South Sudan's exports, but on the domestic front service sectors (financial, post and telecommunications, education and health) generate the highest value, followed by the industrial sector. As far as employment is concerned, the education and health service sectors employ the highest numbers of people, along with the agriculture sector.

While the industrial sector generates significant value with low rates of employment, it is relatively underdeveloped and inefficient. The sector currently is characterized by high emissions and a high degree of resource consumption. Given that it is a focal point for South Sudan's growth plans, in its current state, any push for growth in the sector is likely to be highly resource- and emission-intensive.

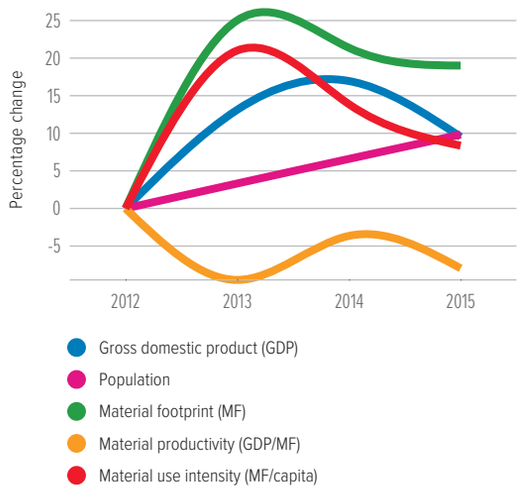
The situation of South Sudan's agricultural sector is the opposite to that of the industrial sector, in that it employs a high proportion of the workforce (25 percent) but has significantly low outputs (SCP-HAT, 2015). The sector also has a high resource consumption and emissions profile, making it rather inefficient.

**Figure 9: Social, economic and environmental parameters**



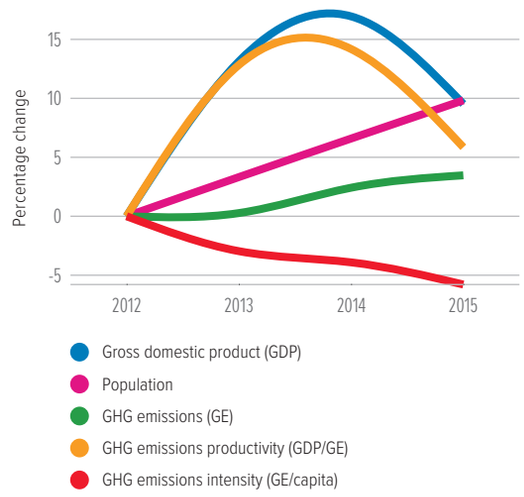

Source: SCP-HAT, 2015

**Figure 10: Material use decoupling trend, 2012–2015**



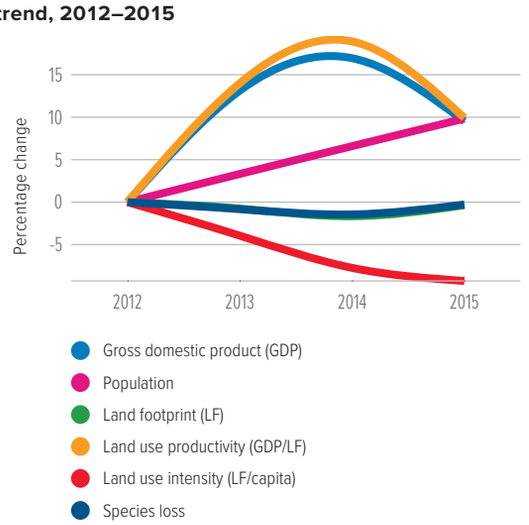

Source: SCP-HAT, 2015

**Figure 11: GHG emissions decoupling trend, 2012–2015**




Source: SCP-HAT, 2015

**Figure 12: Land use and biodiversity loss decoupling trend, 2012–2015**




Source: SCP-HAT, 2015

## 4.2 HISTORICAL TRENDS OF RESOURCE USE AND EMISSIONS

South Sudan's historical trends of economic growth against its resource consumption and emissions profile were studied as part of this assessment. It was found that the country consumes relatively fewer material resources than other countries. In the year 2015, its raw material use per capita was 1.32 tonnes against the global average of 11.9 tonnes per capita (SCP-HAT, 2015). Material use in neighbouring countries such as Sudan and Kenya was also higher than in South Sudan, at 4.2 and 3.3 tonnes per capita, respectively (ibid.). Given this low rate of material consumption, South Sudan is likely to regenerate or renew its resources at a comparatively higher rate. However, with increased economic growth and development this scenario could change.

Figure 10 illustrates how growth and development in South Sudan is significantly dependent on its material consumption. This is evident from South Sudan's material footprint which observes a trend in line with the trend in the GDP. Thus, there is minimal decoupling between material use and the wider economy.

Similarly, in the case of GHG emissions, the change in GHG emissions productivity follows the same trend as the GDP. With the growth in the economy, GHG emissions are also likely to continue to increase in the future. Thus, there is minimal decoupling between South Sudan's economic growth and GHG emissions.

As with material use and GHG emissions, there is minimal decoupling when it comes to South Sudan's economic growth and its corresponding land use footprint.[4] Decreasing land use intensity,

4 The 'land footprint' accounts for the total land area used to produce the goods and services consumed in a country. In South Sudan, the land is used mainly for agriculture and forestry.

signifying greater stressors on South Sudan's land due to increasing population, is also leading to a gradual loss of biodiversity.

Overall, while the population in South Sudan is increasing, the intensity of material use, carbon emissions and land use are observed to be decreasing. This signifies that South Sudan's environmental resources are increasingly being placed under pressure as a result of the increasing population. With the lack of decoupling between its environmental resources and economic growth, it is imperative that the country increasingly adopts a sustainable and circular lifestyle when it comes to utilizing its resources. This will have the dual impact of helping South Sudan decouple its economic growth from its resource use, while at the same time reducing the pressure of an increasing population on its resources.

## 4.3 WASTE PROCESSING AND RECYCLING

South Sudan has an underdeveloped waste management system wherein most of the waste that is generated either goes to a landfill site or is openly burnt. There are very limited formal waste management systems or waste reprocessing facilities in South Sudan. However, there is a growing informal waste recycling market in the country. Informal waste pickers collect recyclable materials from dumping sites, such as plastics, metal scrap and tyres, which they sell to private companies. Around 15 private companies operate in the city of Juba. They deal with four different types of waste, which they export to the neighbouring countries of Uganda and Kenya. These are:

- scrap metals (collected and exported)
- hard plastic (shredded and sold)
- plastic bottles (defective bottles are exported)
- aluminium (either melted and converted into decorative items or exported).

In 2018, South Sudan exported plastic waste worth $5,230, used clothes and textiles worth $1,667 and ferrous scrap worth $2.34 million to Uganda. Of the ferrous scrap, materials exported included cast iron (29.6 percent), stainless steel (0.7 percent) and tinned iron or steel (69.7 percent) (Atlas of Economic Complexity, 2018).

## 4.4 MAPPING RESOURCE FLOWS, STOCKS AND OUTPUTS

### 4.4.1 Resource flows

Materials consumed have been mapped for all key economic sectors in South Sudan. The material flows mapped are discussed below.

**Biomass** includes crops, crop residue, fish and wood, which are used to make food products, animal products and wood products (e.g., furniture, construction materials and packaging).

Biomass is the most consumed resource in the country (Figure 13). The majority is consumed by the industrial sector, followed by agriculture and public services (education, health and public administration) (Figure 14).

All crops, crop residue and fish produced in the country are consumed within the country itself, demonstrating the existence of a circular economy for this material (International Resource Panel, 2020). Some of the wood produced in the country is exported to Uganda, Jordan, Pakistan and China. Wood is also imported from Sweden, Uganda, China and Japan (Atlas of Economic Complexity, 2018). Table 3 shows biomass consumed in South Sudan in 2015.

**Figure 13: Resource consumption in South Sudan**

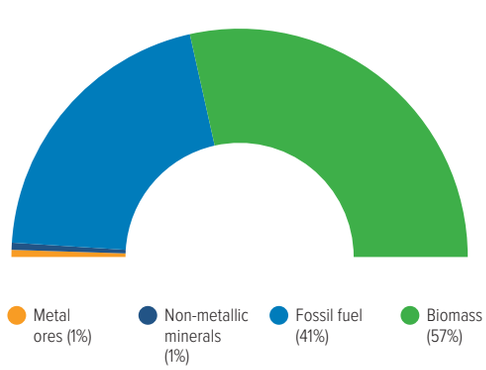
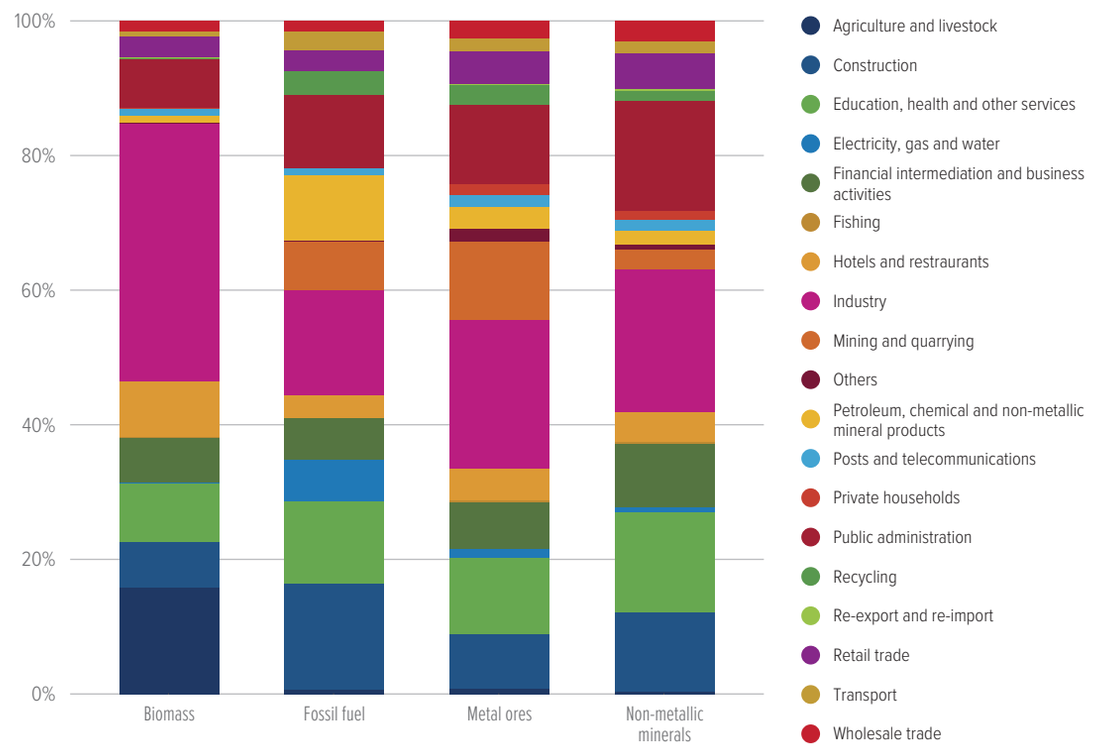


**Figure 14: Resource consumption by sector, 2015**




Source: SCP-HAT, 2015

**Fossil fuels** include petroleum and its products. They are primarily used in the construction and industrial sectors, followed by public services (education, health and public administration) and the petroleum sector itself (Figure 14). The majority of the crude oil extracted in the country is exported to China while petroleum products like heavy oil, diesel oil and petrol are imported from countries that include Sudan, Uganda, China, Canada, Russia and Ukraine (Atlas of Economic Complexity, 2018).

**Metal ores** include raw and processed metals, as well as products made from them. These range from iron plates and copper wiring to vehicles, machinery and metal building structures. Metal

**Table 3: Biomass consumption, 2015**

| Category | Domestic extraction (kilotonnes) | Domestic consumption (kilotonnes) |
|---|---|---|
| Crop | 4,443.9 | 4,443.9 |
| Crop residue | 2,183.8 | 2,183.8 |
| Fish (wild catch and harvest) | 37.0 | 37.0 |
| Wood | 2,980.4 | 2,980.6 |
| **Total** | **9,645.1** | **9,645.3** |

Source: International Resource Panel, 2020

**Table 4: Fossil fuel consumption, 2015**

| Category | Domestic extraction (kilotonnes) | Domestic consumption (kilotonnes) |
|---|---|---|
| Petroleum, crude | 7,424 | – |
| Petroleum, refined | – | 6,394 |

Source: International Resource Panel, 2020; SCP-HAT, 2015; Atlas of Economic Complexity

ores are used primarily in the industrial, mining and quarrying sectors, followed by public services (education, health and public administration) and construction (Figure 14). Metal ores are imported from countries like Uganda, China, Pakistan, Japan, Saudi Arabia and Sweden. Some of these ores are passed through and further exported to Uganda and Algeria (ibid.).

**Table 5: Metal ore consumption, 2015**

| Category | Domestic extraction (kilotonnes) | Domestic consumption (kilotonnes) |
|---|---|---|
| Metal ore | – | 105.81 |

Source: SCP-HAT, 2015

**Non-metallic minerals** include salt, sulphur, limestone, cement, quartz and clay construction materials (e.g., cement and lime). They also include products like chemicals, fertilizers and bitumen, which is used in road construction. Non-metallic minerals are used primarily in the industrial sector, followed by public services (education, health and public administration) and construction (Figure 14). These materials are mostly imported from the neighbouring countries of Uganda, Ethiopia and Sudan. Other countries from which they are imported include China, Ukraine, Pakistan and Sweden (Atlas of Economic Complexity, 2018).

**Table 6: Non-metallic minerals consumption, 2015**

| Category | Domestic extraction (kilotonnes) | Domestic consumption (kilotonnes) |
|---|---|---|
| Non-metallic minerals | – | 154.34 |

Source: SCP-HAT, 2015

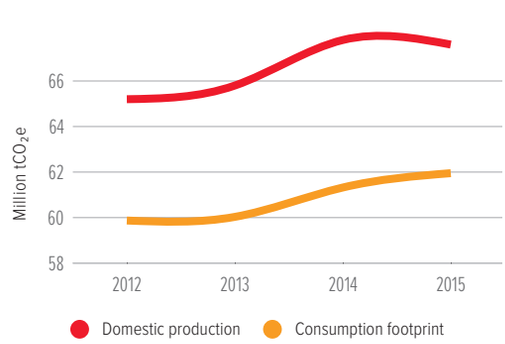
### 4.4.2 Stocks

All materials that flow in an economy have an origin and a destination and interact with various stocks in the process. Stocks refer to any natural and/or physical asset within a country. Since the infrastructure base in South Sudan is currently underdeveloped, the most used stocks in the country are its natural assets (land and forests).

The material that is most used in the country, biomass, is primarily domestically produced from agricultural land and forests. While South Sudan has around 300,000 square kilometres of arable land, less than 5 percent is currently being cultivated (UNEP, 2018a). As a large proportion of the population is dependent on agriculture and livestock, there is likely to be an increase in this percentage in the future. By contrast, forest areas in South Sudan are reducing at an annual rate of 2 percent, as a result of changes in land use for development purposes, or deforestation for firewood or other wood products (ibid.). With this continual decline in forest area, availability of biomass from forest stocks is also likely to decrease in the future.

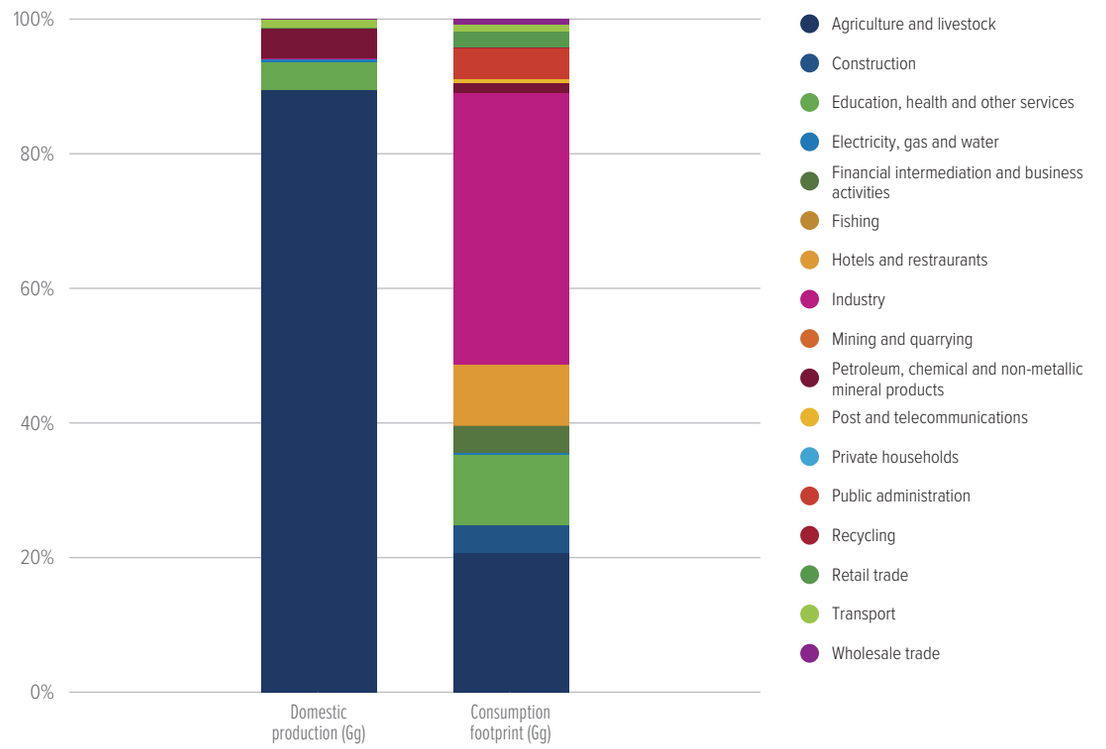
Petroleum products are the second most consumed material in the country and mostly used by physical stocks, such as industry, buildings (commercial and residential) and infrastructure. Given the current push for economic growth and development in the country, these physical stocks are likely to increase by 2030. This could also lead to an increase in the

**Figure 15: GHG emissions trends, 2012–2015**




Source: SCP-HAT, 2015

**Figure 16: GHG emissions by sector, 2015**




Source: SCP-HAT, 2015

consumption of petroleum and petroleum-related products.

### 4.4.3 GHG emissions

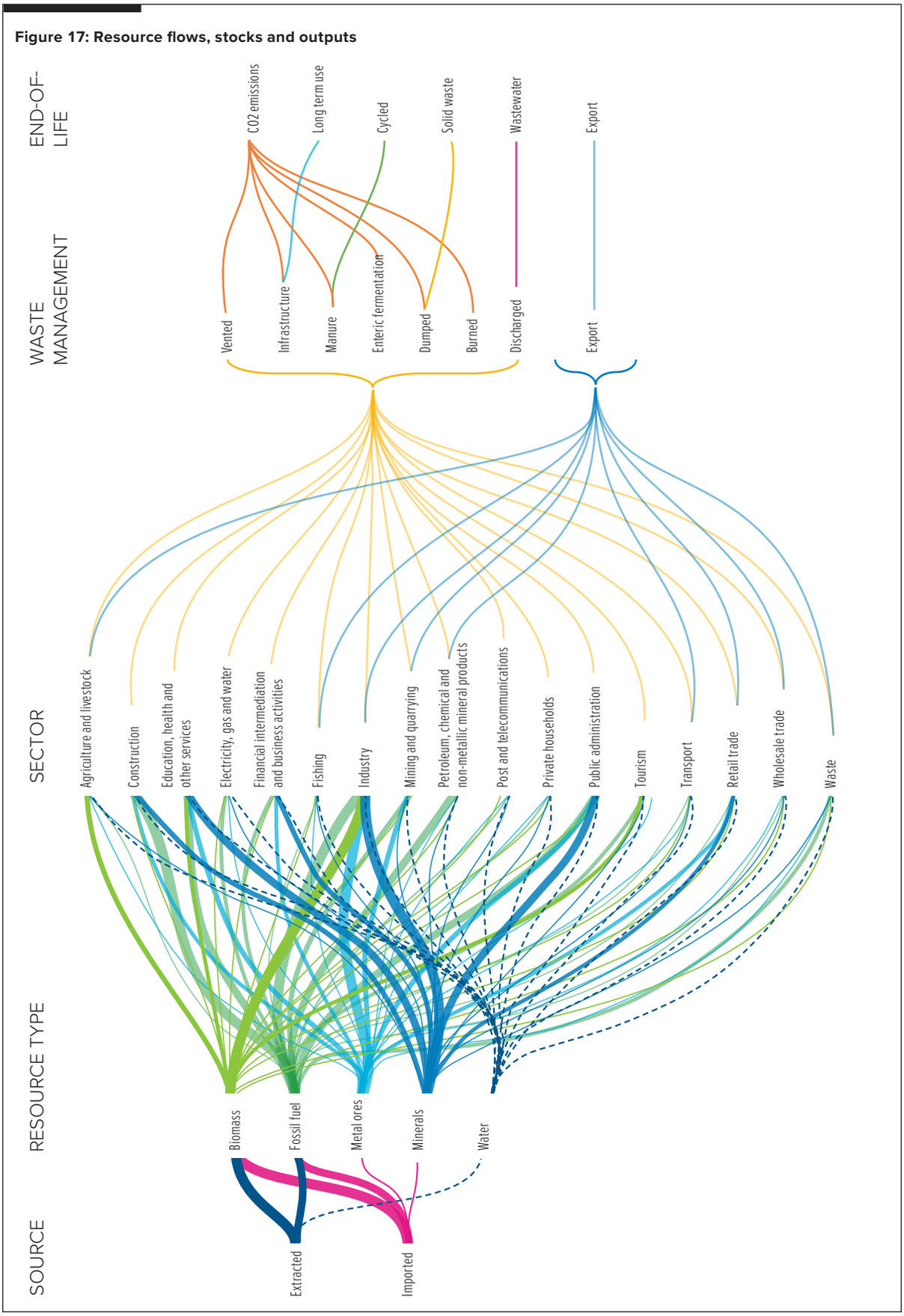
A gradual increase in GHG emissions in South Sudan has been observed over the years, from both a domestic production and resource consumption perspective. Emissions resulting from domestic production and resource consumption have been increasing at rates of 1.22 percent and 1.14 percent per annum, respectively (SCP-HAT, 2015). The slow rise in GHG emissions over the years parallels South Sudan's slow economic and population growth.

GHG emissions from domestic production are mostly from agriculture and livestock, followed by the petroleum and service sectors. In terms of resource consumption, industry, hotels and restaurants and other service sectors account for the maximum amount of GHG emissions, along with the agriculture and livestock sector. This illustrates that while the agricultural sector is the biggest contributor to South Sudan's territorial emissions (emissions from domestic processes), other economic sectors have significant amounts of embedded emissions (emissions that occur in other countries and are associated with imported goods), which contribute to South Sudan's overall GHG emissions footprint.

## 4.5 CIRCULAR OPPORTUNITIES FOR SOUTH SUDAN

Making an economy circular is key if the world is to achieve the Paris Agreement's goal of limiting global warming to 1.5°C above pre-industrial levels. In this regard, the agendas of circular and low-carbon economies are complementary in nature and mutually supportive. Making economies circular helps reduce high rates of material extraction, manage existing and future stocks, and increase levels of end-of-use processing and recycling (Circle Economy, 2020).

**Figure 17: Resource flows, stocks and outputs**




Source: SCP-HAT, 2015; International Resource Panel, 2020

South Sudan is a developing nation with a low material footprint compared to other low and middle income economies; about 57 percent of the material being consumed in the country is renewable or regenerative in nature (biomass as of 2015) (SCP-HAT, 2015). Additionally, South Sudan's growing industrial and infrastructure base provides tremendous potential for incorporating circular elements within its low-carbon growth plans.

Integrating circular interventions at the onset will help the country achieve its NDC targets without compromising its developmental needs. When considering the integration of circularity into its economy, South Sudan needs to deliberate on the following factors (Circle Economy, 2020):

- **Design circularity into new stocks:** Given that South Sudan presently has minimal physical stock levels, green and circular strategies (e.g., green construction) should be integrated at the onset of development to enable a transition towards an asset base that is green, sustainable and cost effective in the long term.
- **Empower the informal economy:** A large part of South Sudan's economy is decentralized and informal. One example is seen in the handling of waste. There are no formal systems for waste collection in the country, but the informal sector actively collects and sells used material, such as plastic and metals, to the private sector, which resells it to neighbouring

**Figure 18: The DISRUPT framework**

| 7 key elements of a circular economy | | |
|---|---|---|
| | **Design for the future** | Adopt a systemic perspective during the design process, to employ the right materials for appropriate lifetime and extended future use and optimal recovery. |
| | **Incorporate digital technology** | Track and optimize resource use and strengthen connections between supply-chain actors through digital, online platforms and technologies. |
| | **Sustain and extend what's already there** | Maintain, repair and upgrade resources in use to maximize their lifetime and give them a second life through take-back strategies, where applicable. |
| | **Rethink the business model** | Consider opportunities to create greater value and align incentives through business models that build on the interaction between products and services. |
| | **Use waste as resource** | Utilize waste streams as a source of secondary resources and recover waste for reuse and recycling. |
| | **Prioritize regenerative resources** | Ensure renewable, reusable, non-toxic resources are utilized as materials and energy in an efficient way. |
| | **Team up to create joint value** | Work together throughout the supply chain, internally within organizations and with the public sector, to increase transparency and create shared value. |

Source: Circularity Gap Report 2020

countries. This potential of the informal sector needs to be harnessed.

- **Build and maintain a sizeable, sustainable bioeconomy:** South Sudan should focus on maintaining its current biodiversity, particularly its forests, while increasing the use and/or recycling of wastes and/or residues from its vast existing bioeconomy (i.e., the agricultural and agroforestry industry).

The aforementioned factors can be crystalized into the seven distinct elements that comprise the DISRUPT framework, as defined in the Circularity Gap Report (2020). The proposed circular strategies in Table 7 were developed using this framework and, on incorporation, will help South Sudan move towards establishing a more circular economy. The strategies are proposed for sectors that have high resource consumption and GHG emission footprints. They have also been incorporated into the NDC strategies (Chapter 7).

**Table 7: Circular opportunities for South Sudan**

| Sector | Circular opportunities | Element coverage |
|---|---|---|
| Agriculture, livestock and fisheries | • Given that there is tremendous potential for growth and development in the agriculture sector, with only 5 percent of total arable land currently being under use, South Sudan should use this opportunity to create targeted agricultural hubs[5] promoting closed agricultural loops. This would not only allow for efficient growth in the sector but also enable waste management and recycling, resulting in a reduction in GHG emissions (Circle Economy, 2020; Louis Dreyfus Foundation, 2020).<br>• Creating such hubs will also help South Sudan cope with the impacts of inefficient markets which, because of wastage, lead to significant post-harvest loss. In addition to bringing markets closer to reduce these losses, South Sudan should focus on preservation by establishing adequate transport and cold-storage solutions. However, given the costly nature of these interventions, this will have to be achieved by exploring innovative business models encouraging increased private sector participation. This will not only help reduce the waste created due to post-harvest losses but also increase the sector's contribution to the country's growth (Circle Economy, 2020; Louis Dreyfus Foundation, 2020).<br>• South Sudan should focus on development and adoption of digital solutions to help farmers stay informed about agricultural markets, including their locations, along with price information. Digital platforms will also help keep farmers informed about climatic conditions that could impact their crops. Use of digital technology will thus enable optimization of resource use and actively contribute to reducing wastage.<br>• South Sudan can also collaborate with non-governmental organizations and donor agencies such as the World Food Programme that are already working towards reducing post-harvest losses, as well as educating farmers (Louis Dreyfus Foundation, 2020).<br>• Developing infrastructure and exploiting the potential of agriculture in the country will need to go hand in hand to ensure that resource extraction happens within the regeneration limit, that minimum waste is produced by the sector and that maximum economic benefit is achieved. | **Design for the future**<br>**Incorporate digital technology**<br>**Sustain and extend what is already there**<br>**Rethink the business model**<br>**Use waste as resource**<br>**Prioritize regenerative resources**<br>**Team up to create joint value** |

5 Agricultural hubs are interconnected agricultural market spaces that are established in close proximity to agricultural land, allowing for quicker and more efficient transportation of agriculture produce and waste between the field and the market.

| Sector | Circular opportunities | Element coverage |
|---|---|---|
| Agriculture, livestock and fisheries (continued) | • The agriculture sector is the highest consumer of raw materials and the largest emitter of GHG emissions in South Sudan. This indicates that the sector is currently highly inefficient (SCP-HAT, 2015). The sector is also vulnerable to the impacts of climate change, such as floods and droughts. Integrating circular interventions in the sector will help it not only become efficient but also reduce the impacts of climate change and strengthen the livelihoods of communities. These interventions could include:<br>◦ Promoting water conservation strategies;<br>◦ Replacing diesel generators with renewable energy technology (e.g., solar pumps);<br>◦ Promoting use of agricultural residue and livestock waste as fertilizer; and<br>◦ Designing seed distribution programmes to ensure high quality and drought-sensitive seeds. | |
| Forestry | • With the growing demand for fuelwood, the rate of deforestation in South Sudan has been observed to be increasing (UNEP, 2018a). Changes in land use for economic activities is also adding to deforestation and loss of biodiversity.<br>• It is therefore important for South Sudan to understand the patterns of deforestation and biodiversity loss that are currently affecting the country and build conservation strategies to counteract them.<br>• Furthermore, it is imperative that these strategies and actions are embedded into the policy and regulatory framework of the country, ensuring that they are viewed and used as long-term, country-wide interventions.<br>• South Sudan should also leverage international programmes, such as the REDD+ programme and Forest Carbon Partnership Facility, that focus on implementing measures for conserving forest cover and reducing emissions from deforestation. | **Sustain and extend what is already there**<br>**Team up to create joint value** |
| Energy | • Currently, South Sudan's electricity grid, which is minimal, is run completely on fossil fuel. Decentralized diesel generators are the most widely used source of electricity in the country. Given these circumstances, the country should focus on utilizing its significant stock of renewable and regenerative sources of energy, such as hydro, solar and wind power, for future centralized and/or decentralized electricity solutions.<br>• South Sudan should also explore options like biomethanization and the use of agricultural residues, and/or natural gas produced and collected at the time of flaring.<br>• Growing demand for firewood is leading to an increase in the rate of deforestation in the country. Given that firewood is a critical source of energy in the country, South Sudan needs to focus on developing highly energy-efficient technologies, such as energy efficient cooking stoves, that can extract more energy from less material. This will actively contribute to decreasing deforestation resulting from the need for firewood.<br>• All the aforementioned measures can be used to leverage climate finance from international carbon markets through the generation and sale of carbon offsets arising from these projects. | **Rethink the business model**<br>**Use waste as resource**<br>**Prioritize regenerative resources** |

| Sector | Circular opportunities | Element coverage |
|---|---|---|
| Industry | • A significant proportion of fossil fuel is consumed by the industrial sector (SCP-HAT, 2015). The currently underdeveloped industrial base provides an opportunity for development of policies to encourage energy efficiency (e.g., waste heat recovery from boilers) and replacement of fossil fuel with renewable fuels such as biofuels and refuse-derived fuel.<br>• In addition to energy-related measures, South Sudan should establish policies around efficient resource management that enable optimal use of material resources like water, while also encouraging reuse and/or recycling of waste. |  **Use waste as resource**<br>  **Prioritize regenerative resources** |
| Infrastructure construction | • Given that the majority of GHG emissions from the construction sector result from the use of imported goods like cement, clay and limestone (SCP-HAT, 2015), South Sudan should develop policies encouraging sustainable procurement. For example, instead of procuring regular cement, South Sudan can incentivize the procurement of cement mixed with fly ash, which will have a smaller emissions footprint.<br>• South Sudan should focus on the development of productive physical stocks (i.e., stocks that last and provide value for many years), such as buildings and infrastructure. This will help reduce short-term construction waste accumulation (Circle Economy, 2020).<br>• At the same time, promoting reuse of construction materials like waste, wood and furniture would further reduce accumulation of construction waste in the long term (Circle Economy, 2020).<br>• South Sudan should update its building regulations and design practices to incorporate green construction norms and standards (e.g., directives for use of sustainable and recycled construction material, installation of water harvesting structures, recycling and reuse of waste outputs and installation of renewable energy).<br>• South Sudan should promote the use of secondary sources in construction of new stocks, such as recycling plastics into tiles. |  **Use waste as resource**<br>  **Prioritize regenerative resources**<br>  **Design for the future** |
| Waste | • The most common way for an economy to become circular is to use waste as a resource and increase its recycling rate. This helps an economy reduce its primary material extraction and increase use of secondary sources. To achieve this, South Sudan will need to create the requisite infrastructure and policy environment to enable a high rate of material recovery and reuse.<br>• Furthermore, South Sudan will need to assess and set up a market for reuse of recovered material. This may require interventions such as regulating reduced costs of recycled material, tax incentives or subsidy schemes (Circle Economy, 2020).<br>• Another intervention for moving faster towards recycling would be regulating extraction and use of primary resources. With a reduction in supply of primary resources, demand for recycled or reused resources will increase.<br>• Recycling is a labour-intensive exercise (Circle Economy, 2020). Apart from policies and infrastructure, South Sudan's public entities (e.g., urban local bodies and municipalities) will need to explore business models to team up with the informal sector and private recyclers to facilitate the process of recycling and reuse (e.g., improving digital access of the informal sector could help bring supply and demand together).<br>• Additionally, efforts will be required from the government to up-skill and organize the informal sector, as well as improve their working conditions. |  **Rethink the business model**<br>  **Use waste as resource**<br>  **Incorporate digital technology**<br>  **Team up to create joint value**<br>  **Prioritize regenerative resources** |

# 5 SECTOR PRIORITIZATION

It is essential to consider socio-economic parameters **in addition to climate change parameters for assessment.**

## SECTOR PRIORITIZATION

The sector prioritization exercise was conducted to identify and finalize sectors for further assessment and inclusion in the NDC. The steps for sector prioritization are detailed below.

1. **Finalizing sectors for prioritization:** Of the 24 sectors evaluated during the metabolic assessment, the following eight were included under 'Industry', leaving a total of 17 sectors for assessment:
   - Electrical and machinery
   - Metal products
   - Wood and paper
   - Food and beverages
   - Transport equipment
   - Maintenance and repair
   - Textiles and wearing apparel
   - Other manufacturing.
2. **Finalizing parameters for prioritization:** Because South Sudan aims to transition to a middle-income economy and has been experiencing significant growth in some economic sectors, it is essential to consider socio-economic parameters in addition to climate change parameters for assessment. Therefore, the following parameters were finalized for prioritization of sectors:
   - **Economic (output and final demand**): Since GDP information was not available for all sectors, output and final demand values from SCP-HAT data were used.
   - **Environment (GHG emissions):** Since sector classification in South Sudan's Initial National Communication to the United Nations Framework Convention on Climate Change (NATCOM) (South Sudan Ministry of Environment, 2018)and SCP-HAT was different and detailed sector breakdowns were not available in the NATCOM, SCP-HAT data on GHG emissions from domestic production and resource consumption were used.

- **Socio-economic (employment):** Since employment information for all sectors was not publicly available for all sectors, SCP-HAT data were used for this assessment.
- **NDC alignment:** The inclusion of each sector in the current NDC was assessed to understand the importance it holds for the second NDC.
- **Potential for green growth:** Each sector's possible future growth trajectory with respect to low-carbon development was assessed. For this, each sector was classified as follows:
    - Green: A sector that will allow for green development;
    - Non-green: A sector that is important for the country's development but will not contribute to green development; and
    - Neutral: A sector that is important for the country's development and is likely to become green as a result of initiatives in green sectors.

**Table 8: Scores for sector prioritization**

| **GHG emissions** | |
|---|---|
| **% of emissions** | **Score** |
| 0–20 | 1 |
| 21–40 | 2 |
| 41–60 | 3 |
| 61–80 | 4 |
| 81–100 | 5 |
| **Potential for green growth** | |
| **Category** | **Score** |
| Green growth | 2 |
| Non-green growth | 0 |
| Neutral | 1 |

3. **Normalization of datasets for each parameter:** Given that all data were available in different units, the data were normalized to make them comparable with other parameters.
4. **Finalizing weights and scoring methods for each parameter:** Weights were assigned to parameters based on their importance with respect to the NDC and the country's growth. A scoring method was devised based on the datasets for each parameter and was assigned to each sector. Sectors with higher GHG emissions were allocated higher scores as developing strategies for reducing emissions in these sectors should be a priority for the country. Similarly, sectors with high potential for green growth were given higher scores as they will enable South Sudan's progress towards a low-carbon economy.
5. **Estimating the final score and sector prioritization:** The final score for each sector was estimated by adding the scores of all parameters. The eight sectors with the highest scores were prioritized for further assessment. They are:
    - Industry
    - Agriculture, including livestock (agriculture)
    - Tourism (hotels and restaurants)
    - Construction
    - Transport
    - Waste (recycling)
    - Electricity, gas and water
    - Fishing.

The sector prioritization matrix is shown in Table 9, page 65.

The results were discussed with South Sudan's key stakeholders, the United Nations Development Programme (UNDP) and the Ministry of Environment, for finalization of prioritized sectors for further assessment and inclusion in the NDC. Based on inputs from the stakeholders, the following changes were made to the final list of sectors:

- Two sectors, mining and quarrying and petroleum, chemical and non-metallic mineral products, were included in the list. Even if they do not have potential for greening the economy, they are extremely important from the country's development standpoint. It is also important to ensure that they are in sync with the country's low-carbon pathways.
- Other cross-cutting sectors that do not directly contribute to the development of the country but hold equal importance from the standpoint of the environment and communities were included. These three sectors were forestry, biodiversity and ecosystems; health; and disaster risk management.
- The names of some sectors, such as hotels and restaurants, agriculture and recycling were changed to tourism, agriculture and livestock, and waste, respectively, to make them consistent with the country's urban sector classification, as well as with IPCC classification, which has also been used in the current NDC.

Five sectors were added to the above-mentioned eight priority sectors as a result of stakeholders' input, making a total of 13 sectors to be prioritized for detailed assessment. The detailed assessments of each of the 13 sectors were then discussed with relevant stakeholders in South Sudan, such as national-level ministries, research institutions, universities and non-governmental organizations active in the climate change space. Based on the inputs received from these stakeholders, the following changes were made in the prioritized sector classification:

- The agriculture and livestock sector was combined with the fishing sector to form a single sector, agriculture, livestock and fisheries.
- The forestry, biodiversity and ecosystem sector was disaggregated into two sectors, forestry, and biodiversity, ecosystem and sustainable wetland management.

- The electricity, gas and water sector was disaggregated into two sectors, electricity and water.
- The tourism sector was renamed as tourism and recreation.

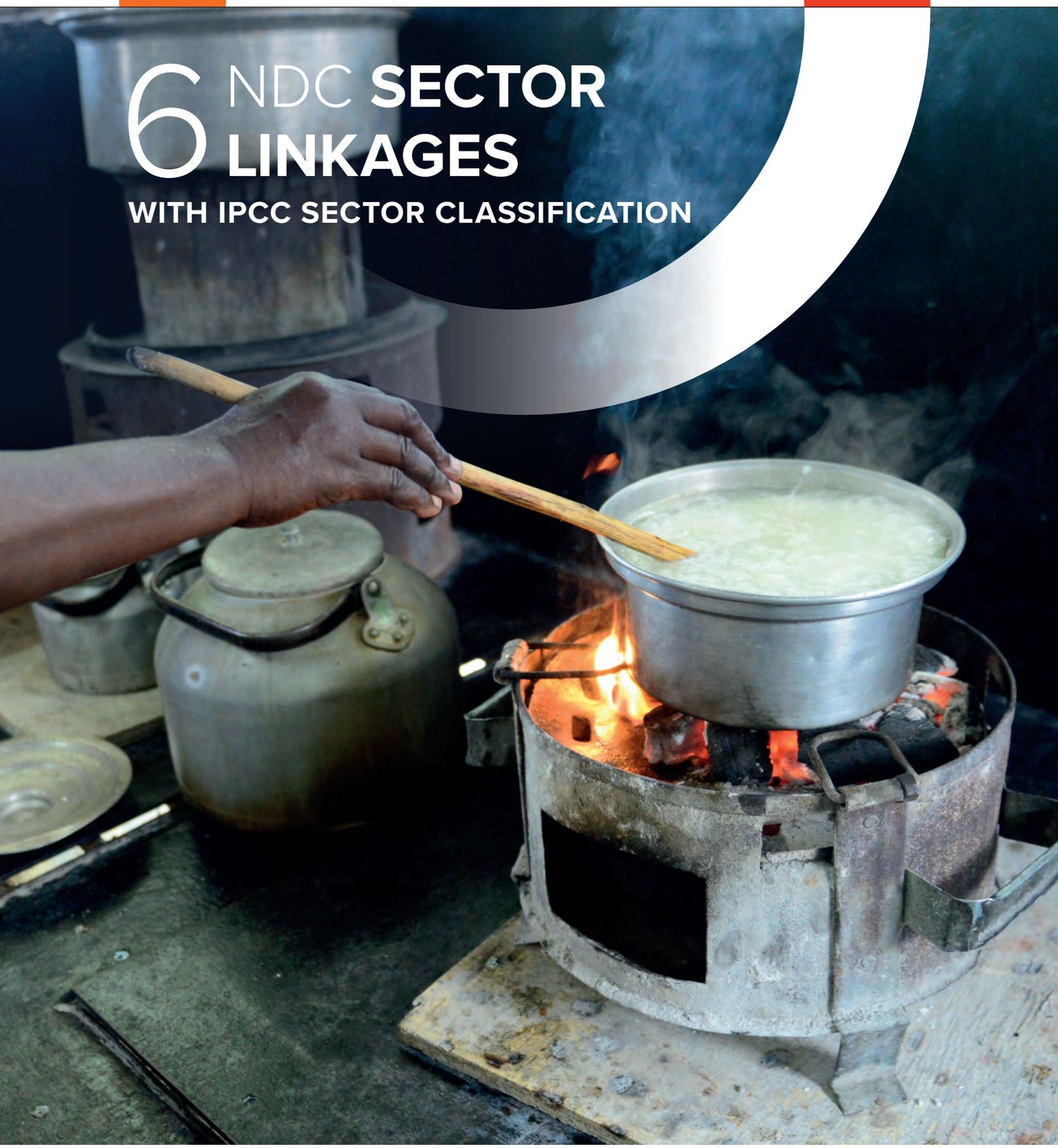
A final total of 14 sectors was arrived at; these were assessed to understand the status of each sector, set emission reduction targets (wherever applicable) and develop mitigation and adaptation strategies. These 14 sectors and their linkages to the IPCC's sector classification has been provided in Chapter 6.

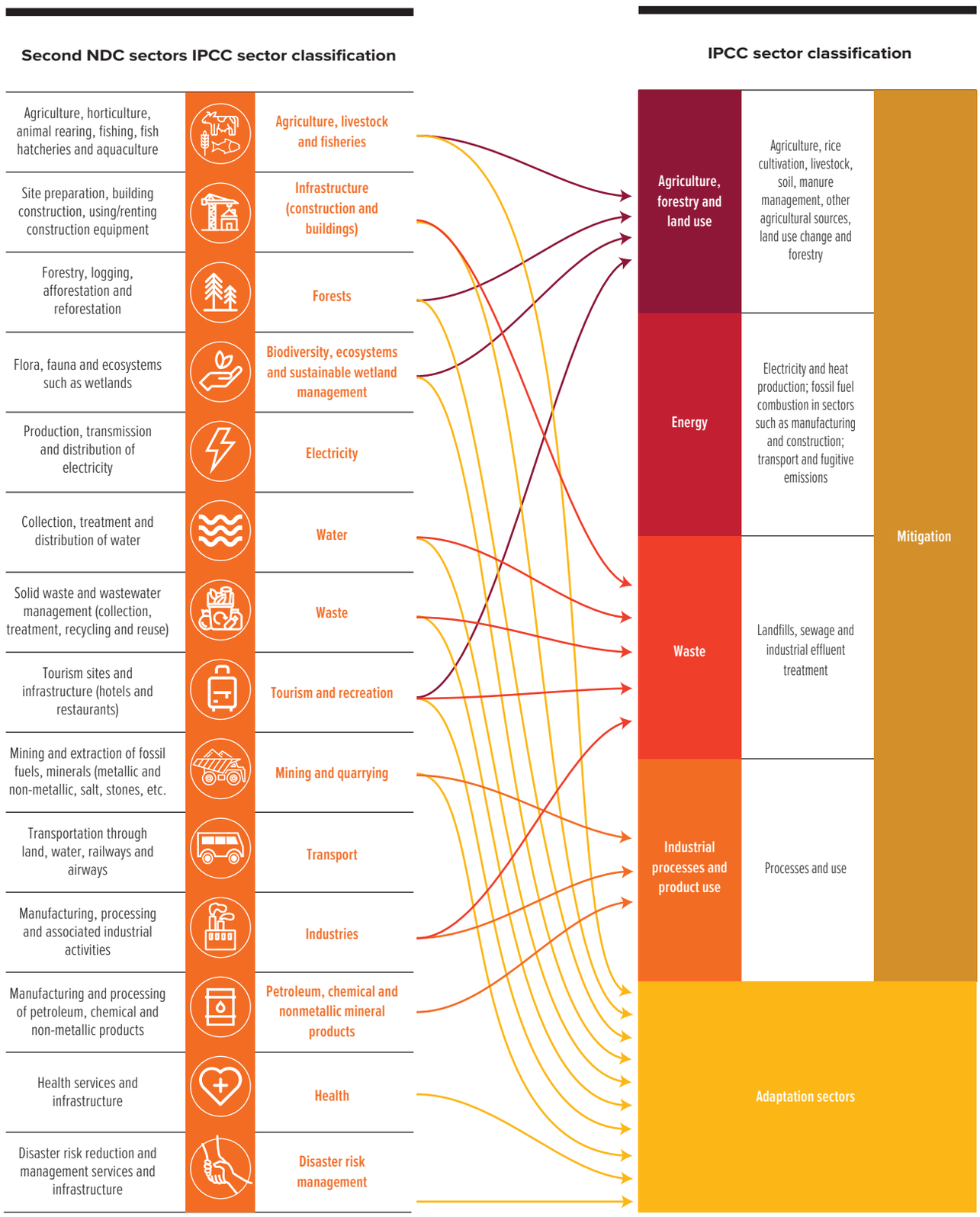
**Table 9: NDC prioritization matrix**

| S. No. | Sector | Economic | | | | Climate change | | | | Socio-economic | | Others | | | Overall Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Output (domestic production) | | Demand (resource consumption) | | GHG emissions (domestic production) | | GHG emissions (resource consumption) | | Employment (domestic production) | | NDC align-ment | Potential for green growth | | |
| | | 2 | | 2 | | 3 | | 3 | | 2 | | – | 1 | | |
| | | [%]* | Score | [%]* | Score | [%]* | Score | [%]* | Score | [%]* | Score | [Yes/no] | [Green growth/ neutral/non-green growth] | Score | |
| 1 | Industry | 61.30 | 4 | 70.68 | 4 | 0.23 | 1 | 100.00 | 5 | 9.09 | 1 | No | Green growth | 2 | 38 |
| 2 | Agriculture | 5.64 | 1 | 3.33 | 1 | 100.00 | 5 | 51.56 | 3 | 57.89 | 3 | Yes | Green growth | 2 | 36 |
| 3 | Education, health and other services | 36.81 | 2 | 100.00 | 5 | 4.66 | 1 | 25.75 | 2 | 100.00 | 5 | Yes | Neutral | 1 | 34 |
| 4 | Financial intermediation and business activities | 100.00 | 5 | 98.45 | 5 | 0.06 | 1 | 10.16 | 1 | 1.77 | 1 | No | Neutral | 1 | 29 |
| 5 | Public administration | 24.06 | 2 | 79.07 | 4 | 0.01 | 1 | 11.13 | 1 | 11.15 | 1 | No | Neutral | 1 | 21 |
| 6 | Hotels and restaurants | 9.79 | 1 | 25.48 | 2 | 0.01 | 1 | 22.56 | 2 | 1.44 | 1 | No | Green growth | 2 | 19 |
| 7 | Construction | 20.55 | 1 | 49.54 | 3 | 0.08 | 1 | 10.20 | 1 | 15.85 | 1 | Yes | Green growth | 2 | 18 |
| 8 | Retail trade | 13.20 | 1 | 36.92 | 2 | 0.01 | 1 | 5.87 | 1 | 6.84 | 1 | No | Neutral | 1 | 15 |
| 9 | Wholesale trade | 16.52 | 1 | 21.47 | 2 | 0.01 | 1 | 2.00 | 1 | 8.87 | 1 | No | Neutral | 1 | 15 |
| 10 | Transport | 13.21 | 1 | 11.42 | 1 | 1.41% | 1 | 2.18 | 1 | 2.99 | 1 | Yes | Green growth | 2 | 14 |
| 11 | Recycling | 0.49 | 1 | 1.69 | 1 | 0.12% | 1 | 0.52 | 1 | 0.01 | 1 | Yes | Green growth | 2 | 14 |
| 12 | Electricity, gas and water | 9.38 | 1 | 7.23 | 1 | 0.33% | 1 | 0.51 | 1 | 0.55 | 1 | Yes | Green growth | 2 | 14 |
| 13 | Fishing | 0.00 | 1 | 0.00 | 1 | 0.00% | 1 | 0.00 | 1 | 12.44 | 1 | Yes | Green growth | 2 | 14 |
| 14 | Post and telecommunications | 13.95 | 1 | 13.74 | 1 | 0.01% | 1 | 1.23 | 1 | 2.92 | 1 | No | Neutral | 1 | 13 |
| 15 | Private households | 0.19 | 1 | 1.09 | 1 | 0.00% | 1 | 0.16 | 1 | 0.00 | 1 | Yes | Neutral | 1 | 13 |
| 16 | Petroleum, chemical and non-metallic mineral products | 18.09 | 1 | 8.42 | 1 | 4.80% | 1 | 3.75 | 1 | 1.75 | 1 | No | Non-green growth | 0 | 12 |
| 17 | Mining and quarrying | 2.93 | 1 | 0.54 | 1 | 0.01% | 1 | 0.02 | 1 | 2.02 | 1 | No | Non-green growth | 0 | 12 |

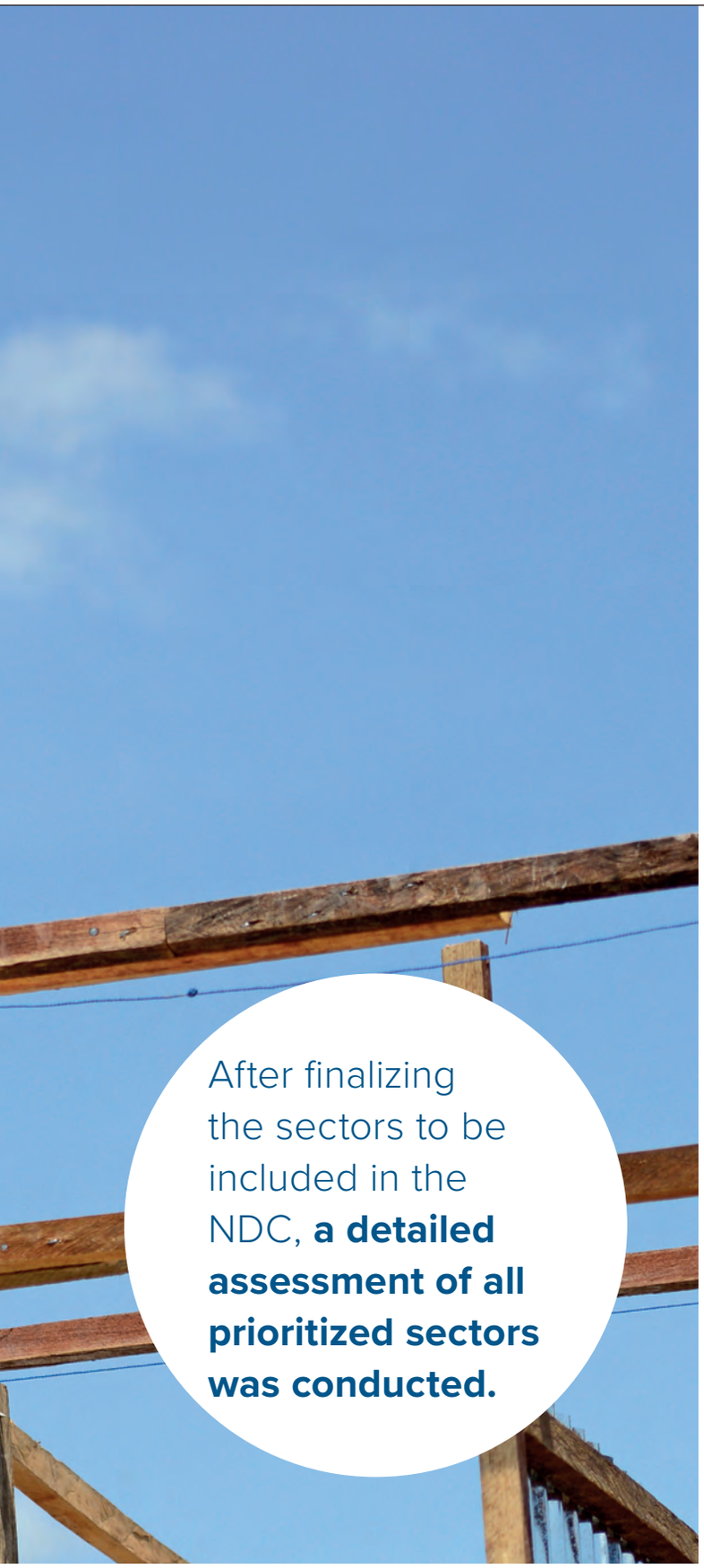
* Normalized values

# 6 NDC SECTOR LINKAGES
## WITH IPCC SECTOR CLASSIFICATION




Second NDC sectors IPCC sector classification
IPCC sector classification
Agriculture, horticulture, animal rearing, fishing, fish hatcheries and aquaculture
Agriculture, livestock and fisheries
Site preparation, building construction, using/renting construction equipment
Infrastructure (construction and buildings)
Forestry, logging, afforestation and reforestation
Forests
Flora, fauna and ecosystems such as wetlands
Biodiversity, ecosystems and sustainable wetland management
Production, transmission and distribution of electricity
Electricity
Collection, treatment and distribution of water
Water
Solid waste and wastewater management (collection, treatment, recycling and reuse)
Waste
Tourism sites and infrastructure (hotels and restaurants)
Tourism and recreation
Mining and extraction of fossil fuels, minerals (metallic and non-metallic, salt, stones, etc.
Mining and quarrying
Transportation through land, water, railways and airways
Transport
Manufacturing, processing and associated industrial activities
Industries
Manufacturing and processing of petroleum, chemical and non-metallic products
Petroleum, chemical and nonmetallic mineral products
Health services and infrastructure
Health
Disaster risk reduction and management services and infrastructure
Disaster risk management
Agriculture, forestry and land use
Agriculture, rice cultivation, livestock, soil, manure management, other agricultural sources, land use change and forestry
Energy
Electricity and heat production; fossil fuel combustion in sectors such as manufacturing and construction; transport and fugitive emissions
Waste
Landfills, sewage and industrial effluent treatment
Industrial processes and product use
Processes and use
Mitigation
Adaptation sectors

# 7 SECTORAL **STRATEGIES**



After finalizing the sectors to be included in the NDC, **a detailed assessment of all prioritized sectors was conducted.**

## SECTORAL STRATEGIES

After finalizing the sectors to be included in the NDC, a detailed assessment of all prioritized sectors was conducted. This assessment along with the outputs of the material flow analysis and inputs received from various stakeholders were used to develop mitigation and adaptation strategies for each individual sector. These adaptation and mitigation strategies are further classified into three types based on the time-frame that will be required for each individual strategy's inception and countrywide deployment:

- **Short-term strategies** (0–3 years) include interventions and/or activities that can be readily implemented in the short term, such as the establishment of policies, guidelines or regulatory frameworks and/or building the capacity of key stakeholders.
- **Medium-term strategies** (4–7 years) include commercially viable measures and interventions that require policies and regulations for their implementation.
- **Long-term strategies** (8–10 years) include advanced technological interventions that are likely to become more feasible with economic development, growth and increased awareness of the population.

Implementation of all sectoral adaptation and mitigation strategies in South Sudan will depend on a strong governance and institutional framework in the country to support the execution of NDC interventions.

## 7.1 AGRICULTURE, LIVESTOCK AND FISHERIES

### 7.1.1 Current status

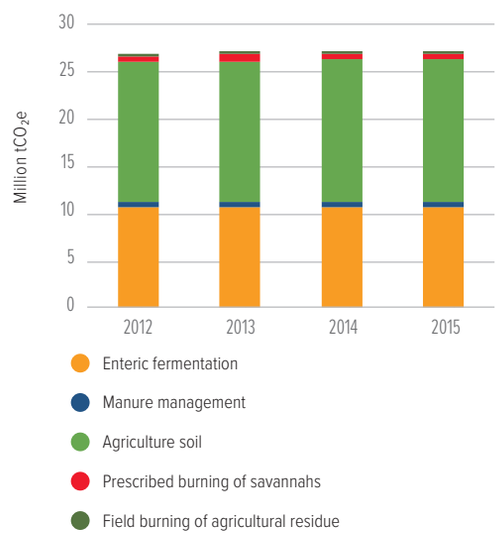
*Agriculture and livestock*

South Sudan has about 300,000 square kilometres of arable land; less than 5 percent of this is currently under cultivation. With diverse soil and climatic conditions, the country produces a variety of crops including sorghum, maize, rice, cassava, sesame, beans, fruits and vegetables, as well as coffee, tea, cotton and sugar cane (South Sudan Ministry of Environment, 2018). Most agriculture is rain fed, and the use of chemical fertilizers and pesticides is insignificant.

Cultivation and livestock rearing are the main livelihood activities for most households in South Sudan; about 81 percent of households cultivate land and 74 percent owns livestock. Even though agriculture and livestock rearing employ a large number of people, agricultural productivity remains low because traditional and inefficient agricultural practices are followed. For instance, South Sudan's cereal production has been declining since 2013; in 2017 cereal production was estimated to be 765,000 tonnes, 25 percent lower than in 2013 (FAO, 2017). Furthermore, more than 50 percent (6.5 million) of South Sudan's population was food insecure in 2020 (Food Security Information Network, 2020). Food insecurity is likely to exacerbate with climate change, making farmers and pastoralists extremely vulnerable. Increasing climate variability and extreme weather events, such as floods and droughts, impact water availability and make croplands and rangelands more susceptible to degradation. This will disrupt food production and contribute to food insecurity and malnutrition.

Agriculture is also the largest emitter of greenhouse gas (GHG) emissions in South Sudan. The share of emissions from the sector was about 74 percent – 26.8 million $tCO_2e$ – of the total emissions in 2015. The majority of these emissions originated from agricultural soils and enteric fermentation, which together made up more than 90 percent of the agriculture sector's total GHG emissions (Figure 19).

**Figure 19: GHG emissions from domestic production in the agriculture sector, 2012–2015**




Source: South Sudan Ministry of Environment, 2018

Given this scenario, the Government of the Republic of South Sudan has implemented various policies and plans to increase agriculture productivity and address environmental impacts to improve the livelihoods of its people. These policies and plans include, amongst others, the Comprehensive Agriculture Master Plan (CAMP), 2015–2040; the National Policy on Food Security; the National Adaptation Programme of Action (NAPA); the National Development Strategy (NDS); and South Sudan's Vision 2040.

The CAMP (South Sudan Ministry of Agriculture, Forestry, Cooperatives and Rural Development and Ministry of Livestock and Fisheries Industries, 2017) is an investment plan that aligns with national policies and identifies key focus areas and associated investments required for the growth of the agriculture sector. The NAPA (South Sudan Ministry of Environment, 2016) aims to promote climate-smart agricultural practices and enable implementation of projects identified in the agriculture master plan. Both the NDS (South Sudan Ministry of Finance and Planning, 2018) and

South Sudan's Vision 2040 (2011) aim to enhance agricultural productivity to increase food security in the country. The three-year target for the NDS was to increase food security to 80 percent by 2021.

*Fisheries*

Fishing provides a source of food security and a livelihood to a large number of people in South Sudan. Most fishing takes place in the Sudd wetland, the (White) Nile River, other rivers and floodplains. There are about 115 different species of fish found in the Nile basin including Nile tilapia, Nile perch and African catfish, which are high-value target species.

Although the fishing sector provides employment to a large number of people, fish production remained constant between 2012 and 2015 at 37,020 tonnes per year, and declined by 5 percent in 2016 to 35,020 tonnes (World Bank, 2016). These figures indicate inefficient or poor harvest conditions, and a lack of facilities such as cold storage and refrigerated transport. Greenhouse gas emissions from the fishing sector (from domestic production) also declined by 7 percent in 2015 compared to 2014 (Figure 20).

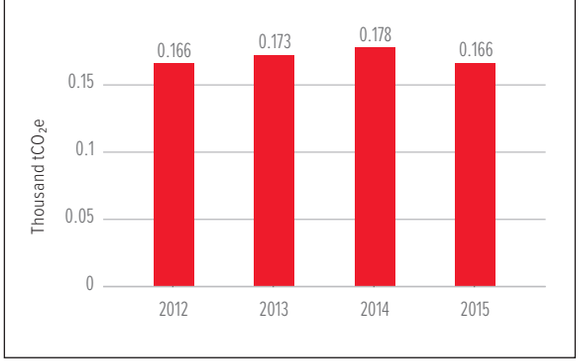
The fishing sector is highly vulnerable to the impacts of climate change. Over the years, South Sudan has witnessed losses in a variety of fish species. Five of 15 fish species in the Lol River have disappeared and fish size has also declined (UNEP, 2018a). A combination of factors, including deforestation, forest fires and over-extraction are responsible for these losses. Future changes in climatic patterns, both long term and seasonal, will also have a detrimental effect on fisheries, since changes in temperature directly influence the reproductive cycle of fish. These changes will have social and economic impacts on the communities dependent on fisheries for their livelihood. The Government of South Sudan has implemented various policies to address these issues, including the Fisheries Policy and the NAPA. The Fisheries Policy of South Sudan highlights the need for monitoring environmental changes affecting fisheries, including climate change, to develop appropriate strategies for responding to climate change and natural disasters. The adaptation programme promotes aquaculture as an alternative livelihood option. The fishing sector is also considered under South Sudan's development policies, including the NDS, Vision 2040 and CAMP to enhance fish production in the country.

### 7.1.2 Emission reduction potential

To estimate potential emission reduction from the agriculture sector, two scenarios have been developed on which projections are made for the period 2016–2030, and are illustrated in Figure 21.

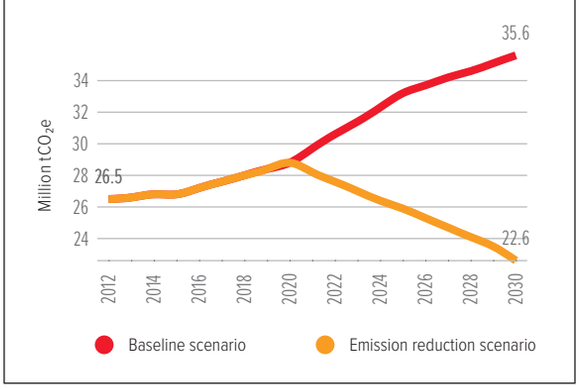
**Baseline scenario:** The baseline emission scenario projects GHG emissions for the agriculture sector based only on the existing policies in South Sudan.

**Figure 20: GHG emissions from domestic production in the fishing sector, 2012–2015**




Source: SCP-HAT, 2015

**Figure 21: Emission reduction scenarios for the agriculture sector, 2012–2030**



The emission trajectory does not reflect any new policies or financing that might be implemented in the sector. Under this scenario, emissions from the agriculture sector rise by 34 percent to 35.6 million $tCO_2e$ by 2030 compared to 2012. This emission trajectory has been sourced from South Sudan's Initial National Communication to the United Nations Framework Convention on Climate Change (South Sudan Ministry of Environment, 2018).

**Emission reduction scenario:** The emission reduction scenario represents the decarbonization pathway that South Sudan will have to follow until 2030 to achieve the Paris Agreement's goal of limiting global temperature rise to 1.5°C. This scenario aims to reduce agriculture production emissions by 18 percent from 2017 levels by 2030, in line with the World Resources Institute emission reduction estimates for sub-Saharan Africa (Lebling et al., 2020). Under this scenario, emissions from the agriculture sector are estimated to be 22.6 million $tCO_2e$ by 2030, which results in 23 percent cumulative emission reduction by 2030 compared to the baseline scenario.

The strategies that will be implemented to achieve the emission reduction targets for the agriculture sector are detailed in the section below.

### Key strategies

#### *7.1.3.1 Mitigation*

The majority of South Sudan's population depends on traditional and inefficient agriculture and livestock management practices, which result in high GHG emissions and low crop productivity. Agriculture accounts for the highest emissions (74 percent) among all the sectors.

To reduce the share of agricultural emissions and achieve the emission reduction targets, South Sudan aims to implement the climate mitigation measures described in Table 10 as priority; these measures focus on reducing methane ($CH_4$) and nitrous oxide ($N_2O$) emissions in particular.

**Table 10: Mitigation strategies for the agriculture sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Agriculture and livestock** | | | |
| **Implement initiatives to reduce emissions related to agricultural soils.**<br>Agricultural soils are a major emitter of GHGs, contributing more than 50% to total agricultural emissions (in 2015). Thus, introducing measures for reducing soil emissions will be a key aspect for South Sudan. | • Promote measures such as crop rotation that require less fertilizer and hence reduce the risk of nitrate leaching into surface and subsurface waters. | Yet to be implemented | Short term |
| | • Promote reduced tillage and modern grazing practices such as zero grazing, to allow carbon to remain in the soil as a result of less microbial activities. | Yet to be implemented | Long term |
| **Promote measures to reduce crop-residue burning.**<br>Field burning of agricultural residue had increased by 61% in 2015 from 2012, with a compound annual growth rate of 17.5%. Thus, South Sudan will introduce measures to reduce the rate of field burning and increase the use of crop residue as manure and/or fodder. | • Interventions such as awareness raising and/or incentivization will be implemented to promote reuse of crop residue (as manure and/or fodder). The constant use of crop residue as manure, as well as reduced tillage, helps reduce emissions by increasing the organic content of the soil, enhancing the amount of carbon sequestered, such that the soil becomes a net carbon sink. | Yet to be implemented | Short term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Promote sustainable and climate-smart livestock management.**<br><br>Since livestock emissions are influenced by the inadequate and poor quality of feed, South Sudan will focus on improving livestock feed quality and adopt practices that reduce livestock methane emissions. | • Disseminate the National Livestock Feed Guide to all the key stakeholders (FAO, 2021). | The final draft of the National Livestock Feed Guide has been developed. | Short term |
| | • Increase uptake of leguminous fodder shrubs; improve grassland management; greater use of locally available supplements to help improve livestock feed. | Yet to be implemented | Medium term |
| | • Implement grazing management strategies, such as rotational grazing, common grazing and zero grazing, that will allow carbon to remain intact in the soil. | Yet to be implemented | Medium to long term |
| | • Carry out continuous monitoring (with regard to duration and frequency) of grazing of animals to reduce soil emissions and erosion. | Yet to be implemented | Medium term |
| **Create agricultural hubs with closed agricultural loops.**<br><br>There is tremendous potential for growth and development in the agriculture sector with only 5% of total arable land currently under use. South Sudan will use this opportunity to create targeted agricultural hubs promoting closed agricultural loops.[6] Creating such hubs will also help South Sudan address the impacts of inefficient marketing, which lead to significant post-harvest loss due to wastage. | • Establishing markets closer to production areas will allow quicker and more efficient transportation of produce, thus helping reduce post-harvest losses. | Yet to be implemented | Medium to long term |
| | • Promote reuse and recycling of waste generated within agricultural systems to ensure efficient waste management and reduction in emissions. | Yet to be implemented | Medium to long term |
| | • Establish adequate transport and cold-storage solutions to reduce post-harvest losses. Given the costly nature of these interventions, this will have to be achieved by exploring innovative business models that encourage increased private-sector participation. This will not only help reduce the waste created due to post-harvest losses, but also increase the sector's contribution to the country's growth. | Yet to be implemented | Long term |
| **Improve or build biogas generators in slaughterhouse facilities.**<br><br>To reduce dependency on fossil fuels, South Sudan will use clean energy alternatives for reducing emissions, such as biogas generation from slaughterhouse facilities. | • Conduct a national feasibility study on the generation and use of biogas in slaughterhouse facilities. | Biogas is being used on a small scale in slaughterhouse facilities in Warrap and Aweil states. | Short term |

6 Agricultural hubs are interconnected agricultural market spaces that are established in close proximity to agricultural land allowing for quicker and more efficient transportation of agriculture produce and waste between the field and the market.

### *7.1.3.2 Adaptation*

Considering that the impacts of climate change on the agriculture and fisheries sector are likely to exacerbate in the future, the following adaptation strategies have been proposed to strengthen the farmers' and system's resilience.

**Table 11: Adaptation strategies for agriculture and fisheries**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Agriculture and livestock** | | | |
| **Promote climate-smart agriculture and livestock techniques.**<br>The agriculture sector is highly vulnerable to the impacts of climate change, in terms of human and economic costs, with long-lasting effects on livelihoods and food security. Therefore, South Sudan will promote climate-smart agriculture and livestock management techniques to increase productivity, reduce vulnerability to droughts and other climate-related risks while reducing GHG emissions. | • Assessment of specific climate-related risks and vulnerabilities on food producing sectors. | Yet to be implemented | Short term |
| | • Develop climate-smart projects on building resilience of livestock and pastoral communities, especially, in rural areas. | Few projects implemented | Short term |
| | • Build the capacity of local communities on climate change. | Yet to be implemented | Short term |
| | • Implement control measures for crop pests and diseases to prevent crop loss. | Yet to be implemented | Short to medium term |
| **Promote the use of climate-resilient seeds and crops.**<br>Given the climate-sensitive nature of the agriculture sector, South Sudan will particularly focus on developing seeds that can withstand droughts and floods (for example, utilizing varieties of flood-resilient rice in flood-prone areas). | • Implement the Seed Policy that was drafted in 2012 by the Ministry of Animal Resources and Fisheries that focuses on establishing a Seed Testing and Certification Agency to control the quality of seed in the country. | The policy has been enacted, but little progress has been made with respect to its implementation. | Short to medium term |
| | • Development of a seed breeding and seed bank centre to provide climate-resilient seed varieties to farmers across the country. | Yet to be implemented | Medium to long term |
| **Adoption of digital solutions to keep farmers informed about agricultural markets.**<br>Digital solutions would help inform farmers about agricultural markets – their locations and price information. Digital platforms would also help inform farmers on various climate conditions that might impact their crops. Use of digital technology would optimize resource use and actively contribute towards reducing wastage. | • Conduct a feasibility study for the development and adoption of digital solutions to enable farmers' access to information on agricultural hubs and climate-related information. | Yet to be implemented | Medium to long term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Promote community-based watershed management.**<br>Establishing rainwater harvesting structures and encouraging communities to participate in watershed management initiatives for maintaining water quantity and quality will be key aspects of the second NDC. | • Excavate *haffirs* (local rainwater harvesting structures) in strategic locations. | Few projects implemented | Short term |
| | • Community-managed construction of boreholes and maintenance of existing ones for use of livestock and their owners. | | Short term |
| **Conduct rangeland mapping to control overgrazing.**<br>To ensure availability of fodder for livestock in a changing climate, South Sudan will conduct rangeland mapping and implement rangeland management plans to control overgrazing. | • Disseminate the National Livestock Feed Guide to all key stakeholders and build the capacity of livestock owners to adopt good practices for managing livestock feed. | The final draft of the National Livestock Feed Guide has been developed. | Short term |
| | • Reseed and introduce high-quality grass seeds in rangelands; encourage communities to produce fodder for commercial purposes. | Yet to be implemented | Medium term |
| | • Promote the adoption of modern grazing techniques such as rotational grazing, common grazing and zero grazing. | Yet to be implemented | Medium to long term |
| **Implement water management initiatives for livestock in regions prone to droughts.**<br>To reduce vulnerability of pastoralist communities during dry seasons, South Sudan will implement water conservation and management initiatives ensuring future water availability. | • Conduct research and develop maps that indicate the rangelands of South Sudan. | Few rangeland maps have been developed for South Sudan by FAO. | Short term |
| | • Utilize the results of studies to construct water harvesting structures and boreholes in states prone to droughts and conflicts over natural resources. At least 10 water harvesting structures and boreholes will be constructed in each state, especially in areas with high livestock concentrations and along cattle routes. (The project is expected to benefit 20,000 households by 2030.) | Yet to be implemented | Short to medium term |
| **Establish quarantine project systems.**<br>The government will establish quarantine project systems to reduce the risk of the transboundary spread of animal diseases such as foot-and-mouth disease (which can have serious socio-economic implications in terms of livestock mortality and costs related to control measures). | • Establish five quarantine points along the national border. | A few, disorganized border quarantine points have been established. | Short term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Focus on improving the livelihoods of pastoralist communities and promoting sustainable livestock management practices.**<br><br>Grazing conflicts between farmers and cattle keepers, irregular movements of livestock across states and the national border to access pastures and water, and incidents of cattle raiding are increasing in the country. To address these issues, South Sudan will focus on formulating a pastoral development policy and on encouraging farmers and livestock keepers to adopt efficient livestock management practices. | • Develop a breeding policy with the aim of improving local breeds of livestock and improving management of resources for haymaking. | A regional livestock breeding strategy has been developed to guide the national-level policy. | Short term |
| | • Formulate a pastoral development policy to ensure sustainable use of pastoral resources for efficient livestock management and improving the livelihoods of pastoral communities. | Included in the National Livestock Development Policy | Short term |
| | • Develop an action plan for implementing the Intergovernmental Authority on Development (IGAD) Protocol on Transhumance to allow pastoralists, especially in water-scarce regions, to access pastures and water across borders of IGAD member states. | The action plan is currently in draft form. | Short term |
| **Introduce an index-based livestock insurance system in the country.**<br><br>South Sudan will introduce an index-based livestock insurance system to protect livestock keepers and pastoralists in drought-prone and arid regions by providing monetary support to them for predicted livestock mortality in times of drought and severe shortages of fodder. | • Conduct a feasibility study for an index-based livestock insurance system. | Yet to be implemented | Short to medium term |
| **Build traditional knowledge to support community-based adaptation.**<br><br>The government will engage with local communities to exchange knowledge and use indigenous skills and knowledge in adaptation planning. | • Conduct and document a study on ethno-veterinary knowledge. | Few sporadic works done | Short term |
| | • Utilize traditional knowledge of rural and local communities into modern plans to support climate adaptation in the sector. | | Short term |
| **Establish herder institutions to train and build the capacity of herders.**<br><br>South Sudan will build the capacity of pastoralists to promote the adoption of climate-smart livestock farming and community-managed disaster risk reduction measures. | • Development of institutions to train pastoralists on climate-smart livestock management and response measures for community-managed disaster risk reduction. | A pastoral livelihoods and education project has been implemented in Lakes State. | Short term |
| **Prioritize the diversification of livelihoods.**<br><br>Given the climate-sensitive nature of the sector, any changes in climatic conditions will negatively impact large numbers of people dependent on agriculture. Therefore, promoting alternative livelihood options becomes paramount to reducing the vulnerability of communities dependent on this sector. | • Implement a bee-keeping project for providing an alternative livelihood option to communities. The project is likely to benefit about 3,000 farmers in the Greater Upper Nile Region, 5,000 farmers in the Bahr el Gazal states and 6,000 farmers in the Equatorial states by 2030. | Yet to be implemented | Short to medium term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Establish early warning systems.**<br>South Sudan will establish early warning systems to help reduce crop losses, as well as strengthen existing livestock early warning systems. | • Develop conflict-mitigation measures to address conflicts on natural resources. | Predictive livestock early warning systems are being piloted in Eastern Equatoria State. | Medium to long term |
| **Fisheries** | | | |
| **Enhance climate-resilient fish production.**<br>Fisheries are an important source of livelihood and provide nutritional security to large numbers of people. Therefore, South Sudan will focus on enhancing climate-resilient fish production by promoting activities such as restoring fish habitats that would contribute to protecting a large number of people dependent on fisheries for their livelihood. | • Restore and sustainably manage fish habitats, especially wetlands such as the Sudd swamps and Nile basin. | Yet to be implemented | Medium to long term |
| **Promote alternative livelihood options.**<br>South Sudan will promote small-scale aquaculture to improve food security by empowering 10% of the farmers across the country by 2030. | • Develop an action plan to implement the National Aquaculture Development Strategy. | The strategy is yet to be enacted in Parliament. | Short term |
| **Enhance the supply chain for the fisheries industry.**<br>Enhancing the supply chain will support communities by minimizing losses (as currently most fish catches are kept in open spaces) due to extreme weather events and will help fishing communities to increase sales and earn more. | • Develop transport infrastructure and cold-storage facilities. | Yet to be implemented | Medium to long term |
| **Build the capacity of communities.**<br>Increase awareness of communities in the fisheries supply chain on climate change and risk management. | • Enhance the capacity of communities on climate change through workshops, training modules and by providing services such as early warning systems. | Yet to be implemented | Short term |
| **Carry out research to assess the impacts of climate change on fisheries and develop knowledge on this.**<br>As highlighted in the South Sudan Fisheries Policy, the country will conduct research and develop a monitoring and reporting framework to assess the impacts of climate change on fisheries. | • Utilize existing academic and research institutions within the country (e.g., Juba University, Yei Agricultural Research Centre) to carry out various studies and review associated literature on the impacts of climate change on key food-producing sectors such as agriculture and fisheries. | Yet to be implemented | Short term |

### 7.1.4 Potential for job creation

*Agriculture and livestock*

A large proportion of South Sudan's population is dependent on cultivation and livestock for their livelihoods. In 2015, the sector provided employment to more than 1,657,000 workers (Figure 22), 25 percent of the total working population.

Traditionally, women and girls perform most of the cultivation-related activities. Furthermore, around 35 percent of the total female workforce was employed in the agriculture sector in 2015, second only after the education, health and 'other services' sector (SCP-HAT, 2018).

South Sudan has large areas of arable land and has great potential for improving agricultural production. Realizing this potential by implementing climate-smart agricultural practices will provide enormous potential to improve livelihoods, especially in rural areas.

Climate-change mitigation and adaptation activities in agriculture can make existing jobs more stable by enhancing productivity and profitability of the farmers, and also generate opportunities for new jobs. Furthermore, climate-smart agriculture also considers gender issues, thus reducing social differences and gender inequality, which would in turn enhance sustainability of the measures. Some of the areas where jobs could potentially be created in the agriculture sector are:

- Skilled pest management;
- Climate-smart livestock management; and
- Businesses involved in agricultural supply chains, including packaging, transportation, distribution and marketing services.

In addition, investments into sectors such as ecotourism, promotion of local food products in the tourism industry and development of transport infrastructure providing farm-to-market accessibility could further improve employment opportunities in agriculture sector.

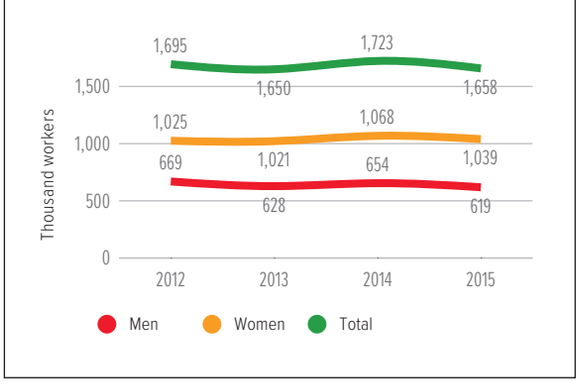
*Fisheries*

According to SCP-HAT data, 14 percent of South Sudan's population is dependent on fisheries for their livelihood.

As shown in Figure 23, employment in the fisheries sector increased by 7 percent per year between 2012 and 2015. Similar to cultivation and livestock, the fisheries sector also has higher female representation, with women making up 62 percent of the total workforce in 2015.

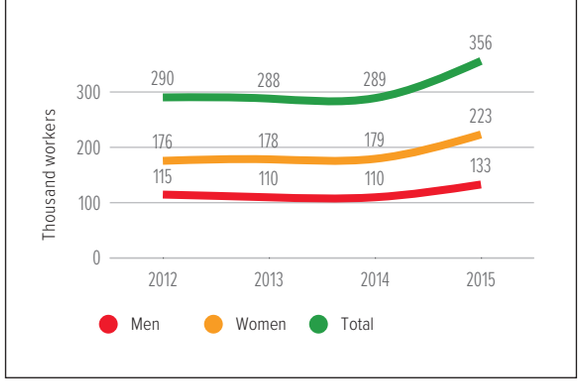
Global demand for fish is expected to increase by 30 percent by 2030 (World Bank, 2020b). Since South Sudan has good fish production potential, the efficient implementation of sustainable initiatives and the promotion of aquaculture could enhance food security and ensure that fisheries contribute towards the country's economy. Aquaculture is a source of better-paying, full-time jobs in many

**Figure 22: Employment in the agriculture sector, 2012–2015**



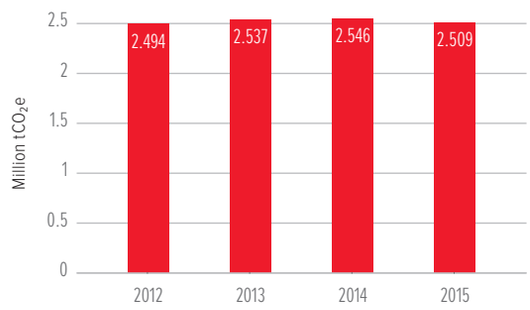

Source: SCP-HAT, 2015

**Figure 23: Employment in the fishing sector, 2012–2015**



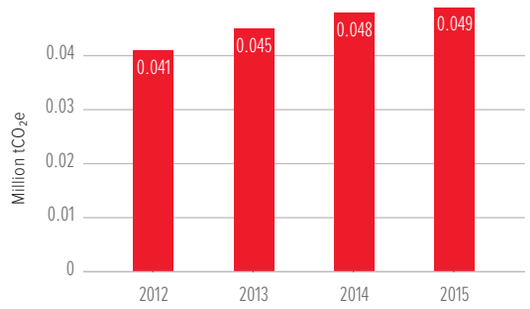

Source: SCP-HAT, 2015

**Figure 24: GHG emissions consumption footprint for the infrastructure sector, 2012–2015**




Source: SCP-HAT, 2015

**Figure 25: GHG emissions domestic footprint for the infrastructure sector, 2012–2015**




Source: SCP-HAT, 2015

African countries, for example, Madagascar, Zambia and Zimbabwe (FAO, 2020a).

South Sudan could create more jobs by enhancing its supply chain and training farmers (especially, small-scale farmers) on fish farming, as well as on seed and feed production and providing technical knowledge on sustainable farming practices.

## 7.2 INFRASTRUCTURE (CONSTRUCTION AND BUILDINGS)

### 7.2.1 Current status

South Sudan currently lacks basic infrastructure such as roads, sewer and electricity supply networks. Therefore, development of basic infrastructure is one of the main priorities of the growth strategies of South Sudan. The government is planning to invest a significant share of its spending towards infrastructure development. The budget allocated to the sector went up many fold in the 2019/2020 financial year when government spending increased from 3 percent of total spending in 2018/2019 to 55 percent in 2019/2020 (South Sudan Ministry of Finance and Planning and the United Nations Children's Fund, 2019). Thus, with the implementation of planned investments and projects, the sector represents increased growth opportunities along with great potential for GHG mitigation (SCP-HAT, 2018).

Currently, most of the raw materials required for construction, such as cement and iron sheets, are imported from neighbouring countries such as Kenya and Uganda. Only small-scale manufacturing of construction materials, such as bricks, is carried out by local enterprises in South Sudan. As a result, most of the GHG emissions in the infrastructure sector are embedded emissions in imported products. In 2015, the share of GHG emissions from the consumption footprint perspective was 4 percent (2.51 million $tCO_2e$; Figure 24) of the total consumption footprint of GHG emissions (61.9 million $tCO_2e$). Greenhouse gas emissions from domestic production, however, was only 0.05 million of carbon dioxide equivalent (Figure 25), contributing 0.07 percent of the total domestic production GHG emissions (67.6 million $tCO_2e$).

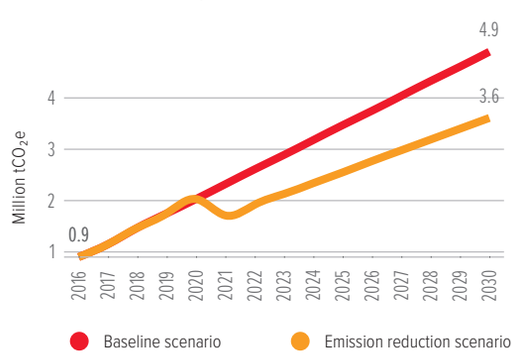
Apart from becoming a high emitter, the construction industry is also becoming increasingly vulnerable to the impacts of climate change. For instance, floods that hit Eastern Equatoria in 2019 destroyed over 440 houses and affected more than 10,000 households (ReliefWeb, 2019). The extent of damage to infrastructure is likely to increase in future, since long-term climatic projections for South Sudan suggest increasing variability in rainfall and increasing frequency of extreme weather events such as floods and droughts. Given this scenario, the Government of South Sudan through its adaptation plan (the NAPA) highlights the need to construct climate-resilient infrastructure as an adaptation to manage disaster risk in the country.

### 7.2.2 Emission reduction potential

As discussed above, South Sudan currently lacks basic infrastructure and is highly dependent on imports of construction material such as cement, iron sheets, etc. As a result, GHG emissions from domestic production in the infrastructure sector are minimal. Given the marginal contribution of this sector to total GHG emissions (0.07 percent) and unavailability of data on likely growth trajectories, it is difficult to estimate emission reduction targets for the infrastructure sector as a whole.

However, there is potential for reducing the sector's share of embedded GHG emissions in imported construction materials such as cement, which is imported in large quantities (approximately 1.8 million tonnes in 2018). To illustrate the potential of reducing embedded emissions, two scenarios have been developed based on historical cement consumption in South Sudan. Embedded GHG emission values are estimated for the period 2016–2020, and projections are made for 2021–2030 using a statistical model. The two scenarios that are considered for estimating emission reduction potential are the baseline and emission reduction scenario, and are illustrated in Figure 26.

**Figure 26: GHG emission scenarios for the infrastructure sector, 2016–2030**




**Baseline scenario**: The baseline scenario represents a case of no action, i.e., the government will not implement any policy or mitigation strategy to reduce the share of embedded GHG emissions in South Sudan. In the baseline scenario, it is assumed that only ordinary Portland cement is imported. Ordinary Portland cement is the most commonly used cement; it contains up to 95 percent clinker, while the remaining 5 percent is gypsum.

In this scenario, embedded GHG emissions in imported cement increases to 4.9 million $tCO_2e$ in 2030 from 0.9 million tonnes in 2016 (Figure 26).

**Emission reduction scenario:** The emission reduction scenario assumes that the Government of South Sudan will implement policies to regulate that low-carbon cement is imported into the country. It assumes that only green cement is imported to South Sudan, which has average clinker factor of 70 percent.[7] In this scenario, embedded emissions would be 3.61 million $tCO_2e$ in 2030 compared to 4.9 million tonnes in the baseline scenario (Figure 26). The emission reduction scenario achieves a cumulative emission reduction of 9.5 million $tCO_2e$ by 2030, which is 26 percent lower than the baseline scenario. This emission reduction scenario only assumes the use of low-carbon cement. However, the inclusion of other green construction materials would result in even higher emission reductions for the infrastructure sector.

Consequently, South Sudan will implement GHG mitigation strategies that will not only focus on reducing domestic emissions but will also reduce embedded emissions. These strategies are described in the section below.

7 The use of alternative materials such as fly ash in cement reduces the clinker-to-cement ratio and thereby results in lower GHG emissions and lower energy use in cement production. Emissions are avoided due to the reduced amount of clinker required for cement production.

### 7.2.3 Key strategies

*7.2.3.1 Mitigation*

As South Sudan transitions from a low- to middle-income economy, it is likely that GHG emissions from the infrastructure sector will increase from domestic production and through its consumption footprint. To address these potential increases, South Sudan will implement the strategies provided in Table 12 to ensure that the sector grows in a sustainable manner.

**Table 12: Mitigation strategies for the infrastructure sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Regulate the importation of construction material for low-carbon alternatives.**<br>Given that most of the emissions in the infrastructure sector are embedded emissions in imported construction materials, South Sudan will regulate to ensure that green construction materials are imported, which will significantly reduce the sector's share of embedded emissions. | • Develop policy to ensure the importation of low-carbon construction materials (such as mandating that imported cement has a certain proportion of fly ash, which makes it greener). | Yet to be implemented | Short to medium term |
| **Adopt policies, guidelines and national building codes that incorporate climate-change adaptation criteria in any new construction.**<br>Basic infrastructure in South Sudan is currently under development, so South Sudan will adopt policies to incorporate climate-change adaptation criteria in new buildings. | • Develop policies and/or national building codes that promote green and low-carbon buildings, for example, by increasing the share of renewable energy, improving energy efficiency, and developing waste-management and water-harvesting structures, etc. Building codes will also incorporate regulations on using secondary stocks, such as tiles created from plastics. | Yet to be implemented | Short term |
| **Promote use of low-carbon construction materials.**<br>South Sudan will promote the use of low-carbon materials in construction to reduce GHG emissions of the infrastructure sector and to contribute towards efficient waste management. | • The use of materials with industrial by-products (such as fly ash, recycled sand) will be promoted for the construction of buildings. | Yet to be implemented | Short to medium term |

*7.2.3.2 Adaptation*

An increase in riverine floods in the future due to changing climate can have serious impacts on infrastructure. Therefore, the following adaptation strategies have been proposed to strengthen the sector's resilience.

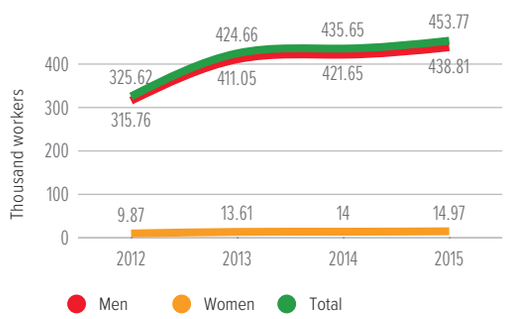
**Table 13: Adaptation strategies for the infrastructure sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Mainstream climate resilience in construction activities.**<br>The government will prioritize awareness creation and promote the use of climate-resilient construction materials to adapt infrastructure to expected changes in climate. Long-term climatic projections for South Sudan suggest increases in the frequency of rainfall and floods and therefore, the focus will be on developing flood-proof infrastructure and increased planning for floods. | • Integrated planning of town and cities to develop sustainable and climate-resilient urban settlements. | Included as part of the NDS | Short term |
| | • Ensure that land-use plans and building codes reflect the expected impacts of climate change. | Included as part of the NDS | Short term |
| **Strengthen land-use policy.**<br>The government will aim to strengthen land-use policies to ensure the sustainable use of natural resources in South Sudan. | • Develop a strategic action plan for the implementation of the National Land Use Policy. | Review of National Land Use Policy is ongoing | Short term |
| **Develop regulations to ensure environmental and social impact assessments for large infrastructure projects.**<br>Develop regulations around conducting mandatory environmental and social impact assessments to ensure that infrastructure projects have minimal negative impacts. The introduction of such policies and regulations in the infrastructure sector, will allow South Sudan to increasingly gain access to international developmental finance. | • Carry out a comprehensive environmental and social impact assessment before the construction of any new infrastructure project. | Yet to be implemented | Short term |
| **Invest in water supply and wastewater treatment infrastructure.**<br>South Sudan will invest in the construction of water supply and wastewater treatment systems (in urban and industrial areas) to ensure efficient water supply while maintaining water quality, thereby reducing water pollution and negative health impacts. | • Establish wastewater treatment and effluent treatment plants. | Yet to be implemented | Medium to long term |

### 7.2.4 Potential for job creation

Employment in the construction sector saw a compound annual growth rate of 11 percent between 2012 and 2015 (Figure 27). Given the nature of work, the sector is largely dominated by a male workforce (97 percent).

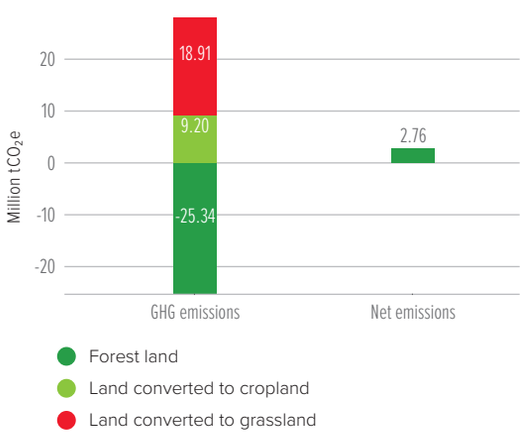
**Figure 27: Employment in the construction sector, 2012–2015**




Source: SCP-HAT, 2015

According to estimates by the International Labour Organization, efforts implemented in the construction sector for limiting temperature rise to 2°C will have a net positive impact on employment. Employment in the sector will be driven by a higher demand for labour for the construction of climate-resilient infrastructure, and other necessary adaptations. For example, the construction of dykes, elevated roads and stronger buildings will be necessary to withstand increasingly extreme weather events. The total number of direct, indirect and induced employment effects of investment in adaptation infrastructure depends on a number of factors and may vary between countries. The employment multipliers are generally higher in developing countries, for instance, for every $1 million invested in the construction sector, close to 650 jobs are expected to be created in India compared to 120 jobs in Russia (International Labour Organization, 2018a). Similarly, a high potential for job creation is expected in South Sudan.

**Figure 28: GHG emissions and sinks in land use, land-use change and forestry, 2015**




Source: South Sudan Ministry of Environment, 2018

## 7.3 FORESTRY

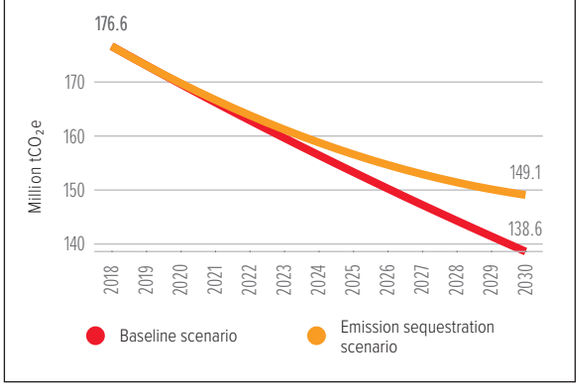
### 7.3.1 Current status

South Sudan has a total forest cover of 192,000 square kilometres, which represents around 30 percent of the country's total land area. This includes natural forests, hills, national parks and game reserves in the country. Of the total forested area, only 3.1 percent (6,400 square kilometres) are gazetted forest reserves. These forest resources play an important role in the economic development of the country and in supporting the livelihoods of rural communities.

However, the forest cover of South Sudan has been severely degraded in some areas of the country. This is because local communities are heavily dependent on forest products, such as timber, fuel wood and non-timber products (for example, food and medicinal resources). Around 81 percent of the population is dependent on fuel wood and 14 percent on charcoal for cooking. South Sudan also witnesses extensive conversion of forests and woodlands into grasslands, pastures and agricultural lands. The current deforestation rate is estimated to be 2 percent per year (UNEP, 2018a). As a result of continual deforestation and rapid conversion of forestlands, land use, land-use change and forestry was a net positive emitter of GHG emissions between 2005 and 2015, with net emissions equal to 2.76 million $tCO_2e$ in 2015 (Figure 28).

Apart from deforestation, other major challenges to sustainable forest management in South Sudan include a lack of coordination between the state and national governments on forest management and a knowledge gap on the current status of natural forest resources at national and regional

**Figure 29: GHG emission sequestration scenarios for the forestry sector, 2018–2030**




levels. As a result, the illegal exploitation of resources is common in the country.

Given this scenario, the sustainable management and conservation of forests is a priority for South Sudan. The government has developed various policies for enhancing forest governance and for promoting sustainable forest management, including the National Forest Policy, the National Environmental Policy and the NAPA. The National Forest Policy provides a nationwide framework for managing forests at all levels across the country and gives responsibility to individual state governments to implement state forest action plans. The National Environmental Policy aims to carry out an extensive afforestation project of planting 100 million trees over a period of 10 years. Furthermore, the current national adaptation plan also stresses the conservation of forests by improving degraded forestlands, promoting agroforestry and emphasizing the need to diversify livelihoods to reduce the dependence of local communities on forests.

### 7.3.2 Emission reduction potential

Two GHG emission scenarios – a baseline scenario and emission sequestration scenario – have been developed for the forestry sector for estimating the GHG sequestration potential of natural forests and woodlands in South Sudan for the period 2018–2030.

**Baseline scenario:** South Sudan currently has 192,000 square kilometres of forestlands, which is declining at an average rate of 2 percent per annum. The baseline scenario represents a case of no action, i.e., the government will not implement a policy to reduce the current rate of deforestation in South Sudan. Hence, the scenario assumes that 2 percent of the forest area will be deforested annually. Under this scenario, more than 40,000 square kilometres of forest area would be lost by 2030, resulting in a loss of GHG sequestration potential of 38 million $tCO_2e$ (Figure 29).

**Emission sequestration scenario:** The emission reduction scenario represents a decarbonization pathway that South Sudan will have to follow till 2030 to achieve the Paris Agreement's goal of limiting global temperature rise to 1.5°C. The emission sequestration scenario targets a 70 percent reduction in deforested area in South Sudan by 2030 compared to 2019 levels. (This is in line with the 1.5°C-compatible target estimated by the World Resources Institute (Lebling et. al., 2020) for the forest sector globally.) Under this scenario, the deforested area is estimated to reduce to 1,152 square kilometres in 2030 (63 percent lower than the 2030 baseline value). The emission sequestration scenario will generate additional sequestration potential of 45 million $tCO_2e$ by 2030 compared to the baseline scenario.

To achieve the potential GHG-sequestration target, South Sudan will implement various strategies which are outlined in the section below.

### 7.3.3 Key strategies

#### *7.3.3.1 Mitigation*

The forestry sector in South Sudan has a high potential for mitigation. However, due to increased land-use change, the sector became a net emitter of GHG emissions in 2015. Deforestation and land-use change will lead to a greater loss in the country's carbon sequestration potential. Furthermore, increased depletion of forest cover will also increase the vulnerability of rural communities to climate variability, as the goods

and services provided by these ecosystems buffer communities against crop failures associated with erratic rainfall, floods and droughts. Deforestation will also have a negative impact on biodiversity and wildlife in the country. In this regard, South Sudan will focus on promoting the initiatives described in Table 14 to reduce deforestation and improve forest management.

**Table 14: Mitigation strategies for the forestry sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Reduce deforestation.**<br>South Sudan aims to declare approximately 30% of its natural forests as reserve forests to reduce the high rate of deforestation. | • Delineate natural forest areas in the states and administrative boundaries of the country for the formation of protected areas. | Survey and inventory units will map forested areas. | Short term |
| | • Plant valuable tree species in open spaces within protected areas to enrich these areas. | Yet to be implemented | Short to medium term |
| | • Monitor changes in forest cover and vegetation either through ground surveys, or by using technologies such as satellite imagery and geographic information systems for regular monitoring. | Yet to be implemented | Short to medium term |
| | • Introduce fire protection and management plans for forested areas. This will also be complemented with establishing stringent rules and regulations to control setting of bush fires. | Yet to be implemented | Short term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Implement afforestation and reforestation projects.**<br>South Sudan aims to implement an ambitious reforestation and afforestation project of planting 100 million trees over a period of 10 years. | • Map degraded areas in the country. | Yet to be implemented | Short term |
| | • Procure seeds of important tree species and the necessary tools and equipment for tree planting. | Yet to be implemented | Short term |
| | • Establish central tree nurseries in states and administrative areas to supply plants for implementation of the tree-planting project. | Yet to be implemented | Short to medium term |
| **Invest in forest-related research.**<br>The government will invest in carrying out forest-related research to identify tree species and breeds that can withstand extreme weather events, such as cyclones and floods, as well as other fast-growing tree species that could be used for rapid expansion of forest cover. | • Engage with existing research and academic institutions in South Sudan to identify tree species that can be used for supporting the country's afforestation project. | Yet to be implemented | Short term |
| **Restore degraded areas.**<br>South Sudan aims to replant trees in degraded areas, especially in water catchment areas. | • Map water catchment areas in the country. | The project is being implemented near Imatong catchment of the Kinety River, however, there has been no progress due to lack of financial resources. | Short to medium term |
| | • Identify suitable tree species and plant these species in predetermined water catchments. | | Short to medium term |
| **Plant trees in urban spaces.**<br>Trees will also be planted outside the forest areas, such as in cities and towns. | • Map urban areas for tree planting. | This project is in its initial stage; minimal work has been done. Progress has halted due to a lack of financial resources. | Short to medium term |
| | • Identify and select suitable tree species for urban forestry. | | Short to medium term |
| **Promote agroforestry.**<br>South Sudan will promote agroforestry, which will not only help sequester carbon but will also provide other benefits such as reduced soil erosion and enhanced agricultural productivity by maintaining soil fertility. | • Raise awareness and build the capacity of key stakeholders on agroforestry practices. | The project is in the initial stage and minimal work has been done. | Short term |
| | • Identify suitable multi-purpose tree species based on parameters such as landscape and climatic conditions in different parts of the country. | | Short term |
| | • Establish central tree nurseries in states and administrative areas to supply plants for the project. | | Short to medium term |
| **Review the Forest Policy to integrate climate-change concerns.**<br>South Sudan will carry out a review of its Forest Policy to integrate climate-change strategies into national and regional plans. | • As part of the Forest Policy, develop regulations to reduce the rate of deforestation by strengthening land-use management planning at the national and local levels, particularly for the mining and logging sectors, which are responsible for extensive deforestation globally. | Yet to be implemented | Short term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Promote the use of alternative fuels.**<br>To reduce dependence on forest resources, especially fuel wood, South Sudan will develop regulations to promote the use of alternate sources of fuel. | • Encourage use of biofuels, such as those derived from refuse and agriculture residue. | Yet to be implemented | Medium to long term |
| | • Install biogas plants in rural areas to meet energy needs for cooking. | Yet to be implemented | Medium to long term |
| **Promote measures such as payment for ecosystem services and benefit sharing.**<br>To avoid depletion of natural resources, South Sudan will participate in international frameworks such as the United Nations REDD+ programme that focuses on implementing measures for reducing emissions from deforestation, for afforestation and the sustainable management of forests, etc. These international programmes will not only increase access to international climate finance but also contribute towards development of national-level land and forest management systems, processes and capacities. | • Implement REDD+ programmes such as beekeeping and aquaculture and to improve charcoal and briquettes production to provide alternate livelihood options to communities. | South Sudan has developed a strategy and action plan for REDD+. | Medium to long term |
| | • Raise awareness amongst various stakeholders regarding REDD+ and build the capacities of communities on forest management activities. | | Short term |
| **Increase awareness of communities on climate change.**<br>To further prevent destruction of forests, South Sudan will raise awareness among different stakeholders, such as local communities and government institutions, regarding climate change and the role of forests in mitigating the impacts of climate change. | • Conduct workshops, seminars and talks on television and radio on climate change. | Yet to be implemented | Short term |

Note: REDD+ is a United Nations framework that aims to curb climate change by stopping the destruction of forests. REDD stands for 'Reducing Emissions from Deforestation and Forest Degradation'; the '+' signifies the role of conservation and sustainable management of forests and enhancement of forest carbon stocks.

*7.3.3.2 Adaptation*

A high rate of deforestation makes communities dependent on this sector for their livelihoods extremely vulnerable. Therefore, the following adaptation strategies have been proposed to reduce the deforestation rate and strengthen community resilience.

**Table 15: Adaptation strategies for the forestry sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Sustainable management of forests through community involvement.**<br>South Sudan will promote the sustainable management of forests through decentralized systems of state ownership and community responsibility. Such joint forest management initiatives will enable efficient and equitable distribution of forest resources and economic benefits (including carbon credits). | • Enable community members to participate in the management of forest lands under the jurisdiction of relevant forest departments. | Yet to be implemented | Short to medium term |
| **Establish early warning systems.**<br>Incidences of pest and disease outbreaks are common in South Sudan; these negatively impact the country's vegetation. Therefore, the government will establish early warning systems dedicated to predicting incidences of pest and disease outbreaks. | • Develop early warning systems and response measures to control widespread pest and/or disease outbreaks to reduce their negative impacts on vegetation. | Yet to be implemented | Short to long term |

### 7.3.4 Potential for job creation

Industries based on forests and natural ecosystems are increasingly recognized as key elements of economic development. Effective implementation of forest management and climate-change strategies in South Sudan will maximize economic and employment benefits in the sector.

Since South Sudan plans to carry out an extensive afforestation project of planting 100 million trees, activities such as land preparation, production of planting material and maintenance adapted to local conditions could be important sources of employment in the country. Afforestation and reforestation activities, including the reclamation of degraded land, will provide high employment opportunities. This is also evident from estimates that suggest that afforestation, reforestation and the control of desertification of 5,000 square kilometres of land annually, could potentially create 4–5 million full-time-equivalent jobs (Nair and Rutt, 2009).

In addition, promotion of community-based forest management and ecotourism in South Sudan will contribute to a more diverse employment base. It will provide more opportunities to the local workforce that has the capacity and traditional knowledge to carry out forest management work, which is needed to improve and restore forest ecosystems. Since women are traditionally engaged in collecting fuel wood and food from forests, they have more knowledge of the trees and forests in terms of biological diversity, sustainable management and conservation practices (FAO, 2014). Thus, if agroforestry and forest management programmes are implemented while recognizing the role of women, it will accelerate female representation in the forestry sector.

## 7.4 BIODIVERSITY, ECOSYSTEM AND SUSTAINABLE WETLAND MANAGEMENT

### 7.4.1 Current status

South Sudan has large areas of natural forests and is rich in biological resources. These include a wide range of animal and plant species and globally important ecosystems such as wetlands (which cover 14.7 percent of the country's land area). South Sudan is home to the Sudd wetland, which is one of the world's largest Ramsar sites and has also been designated as a cultural and natural world heritage site by UNESCO.

The majority of South Sudan's population is directly dependent on forests, woodlands and wetlands for fuel wood, food and various other forest products for their livelihoods. As a result, the diversity of ecosystems and species in the country are under continual threat of human pressures. These ecosystems are continually degrading because of expansion of urban areas and increasing developmental and industrial activities, such as pollution and land conversion. This has a direct impact on the biodiversity of the region. The number of wildlife species has decreased significantly in key wildlife areas of the country. For instance, elephant populations have declined from 20,000 in 1980 to less than 2,500 in 2007, and giraffe populations declined from 96,000 to less than 500 during the same period (UNEP, 2018a).

Increasing climate variability exacerbates this existing stress on South Sudan's ecosystems. Rising temperatures and erratic rainfall have led to floods and droughts in the region, which negatively impact natural ecosystems, especially the ecologically sensitive zones such as the Sudd wetland. According to recent published research, methane emissions from wetlands in East Africa, especially the Sudd wetland, were responsible for about a third of the growth in global emissions between 2010 and 2016. Increased influx of water entering the Sudd wetland, due to dam releases upstream on the Nile River and its tributaries, resulted in increased soil microbial activity and release of methane emissions (Lunt et al., 2019). While this study has been carried out using advanced and reliable technologies (such as geographic information systems and satellite imagery), no ground surveys have been conducted to validate these findings. Given these circumstances, the Government of South Sudan would like to invite international researchers to the country to study and better understand the phenomenon surrounding the wetlands, and assist local stakeholders in developing robust measures and interventions to conserve and control emissions from these areas.

Controlling emissions emanating from the wetlands due to anthropogenic activities and protecting biodiversity and natural ecosystems are key priority areas for South Sudan. South Sudan's NDS highlights the need for biodiversity conservation and management. The NAPA provides details of specific projects for biodiversity management that South Sudan will implement, for example, establishing water points for wildlife in protected areas and promoting alternative sources of livelihoods.

The Government of South Sudan has also drafted the Wildlife Conservation and Protected Area Policy, which provides a legal framework for addressing issues related to landscape management in the country, and guides the sustainable management of natural resources and wildlife. South Sudan joined the United Nations Convention on Biological Diversity in 2014.

### 7.4.2 Key strategies

#### *7.4.2.1 Mitigation*

South Sudan will implement the strategies described in Table 16 for the conservation and sustainable use of wetlands in the country to improve carbon sequestration.

**Table 16: Mitigation strategies for biodiversity, ecosystem and sustainable wetland management**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Conservation and sustainable use of wetlands for improved carbon sequestration.**<br>South Sudan will collaborate with international research institutes and agencies to conduct ground research on the release of methane emissions from the Sudd wetland and develop measures to sustainably manage and mitigate high emissions coming from the country's wetlands. | • Build the capacity of government and research institutions on wetland processes and associated GHG emissions. | Yet to be implemented | Short term |
| | • Identify and classify wetlands, and assess their biodiversity. | Yet to be implemented | Short term |
| | • Bring wetlands under protection for sustainable management. | Yet to be implemented | Short to medium term |
| **Monitor wetland inventory and biodiversity hotspots.**<br>Similar to forest cover monitoring, South Sudan will monitor and develop an inventory of its wetland and biodiversity hotspots through ground surveys or by using other technologies such as geographic information systems and satellite imagery. | • Identify and classify wetlands. | Yet to be implemented | Short to medium term |
| | • Assess threats to wetlands by conducting a vulnerability assessment.. | | |
| **Establish buffer zones around wetlands.**<br>Establish buffer zones around wetlands to limit human activities that negatively impact the value of natural resources. The buffer zones will allow government to cost-effectively manage ecosystems and maintain water quality while protecting human habitat from flood-related damages. | • Assess wetland services. | Yet to be implemented | Short to medium term |
| | • Assess wetland areas of use. | | |
| **Reclaim wetlands.**<br>The government will also focus on restoring degraded wetlands in South Sudan with the aim of reducing their emissions by increasing carbon sequestration and building long-term carbon stock. | • Identify degraded wetlands in the country. | Yet to be implemented | Short term |
| | • Improve wetland resource use. | Yet to be implemented | Short to medium term |
| | • Develop integrated management plans for wetlands. | Yet to be implemented | Short to medium term |
| | • Educated and create awareness amongst the general public for the sustainable management of wetlands. | Yet to be implemented | Short term |

### *7.4.2.2 Adaptation*

As discussed above, a significant proportion of South Sudan's population relies heavily on natural resources such as fuel wood, charcoal and fish, exacerbating the current stresses on ecosystems. Furthermore, ecosystems in South Sudan are increasingly vulnerable to the impacts of increasing industrial activities, including pollution, water abstraction for agriculture, aquaculture and land-use change. Thus, South Sudan will focus on the conservation and management of its biodiversity, ecosystems and wetlands. This will involve the measures described in Table 17.

**Table 17: Adaptation strategies for biodiversity, ecosystem and sustainable wetland management**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Conduct a biodiversity mapping study.**<br>South Sudan will focus on understanding native and endangered species in various regions in the country through a biodiversity mapping study and/or a census. This will enable South Sudan to direct and prioritize conservation resources in a structured manner. | • Utilize the capacity of existing research institutions and universities in the country to conduct a biodiversity mapping study throughout the country. | Yet to be implemented | Short term |
| **Strengthen the National Biodiversity Strategy and Action Plan.**<br>South Sudan will declare commitment to the National Biodiversity Strategy and Action Plan (2018–2027) by showcasing its current implementation status and a roadmap for future implementation. | • Build more comprehensive and strengthened action plans for conserving the biodiversity of South Sudan. | The National Biodiversity Strategy and Action Plan has been developed for South Sudan. | Short term |
| **Reduce the rate of deforestation by promoting alternative sources of energy.**<br>The government will develop suitable regulations and measures for reducing the deforestation rate by increasing access to electricity, introducing alternative sources of energy and strengthening land-use management policies and planning. | • Assess available energy sources. | Yet to be implemented | Short to long term |
| | • Select suitable energy sources that can be sustainably used by communities that are currently dependent on fuel wood. | | |
| | • Develop a roadmap and implementation plan for introducing alternative energy sources. | | |
| | • Monitor and evaluate project performance. | | |
| **Develop waste management policies.**<br>South Sudan will develop regulations in line with proposed waste management policies to reduce the disposal of solid wastes and/or untreated wastewater into water bodies or onto open land. | • Develop and implement a waste management policy. | Yet to be implemented | Short to long term |
| **Promote agroforestry.**<br>South Sudan will promote agroforestry for diversifying land production systems and also to promote alternative livelihood options. | • Assessment of available production systems and the tree and crop species involved. | Yet to be implemented | Short to medium term |
| | • Utilize indigenous and scientific knowledge to identify combinations of tree species that could provide improved livelihood opportunities to people, while also acting as a carbon sink. | Yet to be implemented | Short to medium term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Promote afforestation of degraded landscapes.**<br>South Sudan will promote afforestation of degraded landscapes and of watersheds using multi-purpose tree species to increase community safety nets and to diversify livelihoods. | Planning phase:<br>• Identify degraded sites for afforestation.<br>• Organize a tender to carry out afforestation works. | Yet to be implemented | Short to medium term |
| | Implementation phase:<br>• Develop baselines.<br>• Select tree species and design planting protocols.<br>• Establish forest nursery for seedling production.<br>• Prepare soil.<br>• Implement planting and tending activities. | Yet to be implemented | Short to medium term |
| | Monitoring phase:<br>• Monitor overall project performance.<br>• Monitor carbon levels in trees and soil.<br>• Create project database.<br>• Build capacity and raise awareness of various levels of involved stakeholders. | Yet to be implemented | Short to long term |
| **Develop a management plan to protect watersheds.**<br>The government will develop forest reserves and management plans to protect natural watersheds to maintain water availability and quality. | • Study the existing literature and information available for the country. | Yet to be implemented | Short to long term |
| | • Conduct field studies and stakeholder consultations to gather insight on forest reserves and watershed management practices. | | |
| | • Outline the country's biodiversity targets. | | |
| | • Carry out monitoring and evaluation. | | |
| | • Draft management plans for forest reserves and watershed protection. | | |
| **Introduce wildfire management plans.**<br>South Sudan will introduce fire management plans to prevent and control the spread of wildfires during dry periods and to reduce damage to forest resources and wildlife. | • Plan, implement and monitor.<br>• Research.<br>• Build capacity.<br>• Raise awareness. | Yet to be implemented | Short to long term |
| **Establish wildlife conservancies and protected areas.**<br>South Sudan will establish wildlife conservancies, protected areas and national parks to prevent degradation of forest areas and conserve wildlife. | • Engage with key government stakeholders and communities living adjacent to forestlands to gather their views and consent on changes to protected areas. | Yet to be implemented | Short term |
| | • Assess the status of existing protected areas and national parks, and determine their sizes. | Yet to be implemented | Short term |
| | • Draw an implementation plan to bring forestlands under conservation. | Yet to be implemented | Short to medium term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Establish water points for wildlife.**<br>The government will establish water holes for wildlife in protected areas to ensure that water is available during dry seasons, thus reducing negative impacts on animals. | • Identify and select sites for creation of water holes in protected areas. | Yet to be implemented | Short to medium term |
| **Introduce integrated natural resources management.**<br>Government will promote an integrated natural resources management approach whereby coordination between different stakeholders and development efforts are integrated to address human and institutional factors affecting the conservation of natural resources, as well as affecting livelihoods. | • Identify and select different natural resource management approaches that best fit the context in South Sudan. | Yet to be implemented | Short to medium term |
| | • Implement, monitor and evaluate the performance of identified management approaches. | Yet to be implemented | Medium to long term |
| **Promote ecotourism services.**<br>South Sudan will promote sustainable community-based ecotourism services (for example, in the Southern National Park), including wildlife tourism, to provide improved or alternative livelihood opportunities to rural communities while also protecting biodiversity. | • Engage with communities living near protected areas to increase awareness on the environmental and economic benefits associated with ecotourism. | Yet to be implemented | Short to medium term |
| **Improve national parks and protected areas.**<br>The government will focus on improving the current conditions and landscapes of protected areas to conserve wildlife. | • Engage with communities and seek consent from communities for any changes to the sizes of protected areas. | Yet to be implemented | Short to medium term |
| **Increase awareness and build the capacity of key stakeholders.**<br>South Sudan will focus on building capacity of institutions for conducting baseline surveys to record and monitor changes in environmental pollution, biodiversity loss and natural resources management. In addition, increasing awareness and knowledge among communities regarding climate change and environmental concerns will also be a key focus area. | • Organize interactive and informative talks on radio and television. | Yet to be implemented | Short term |
| | • Organize talks at clubs and schools to spread awareness among youth. | Yet to be implemented | Short term |
| **Strengthen institutional and governance frameworks for implementation of environmental regulations.**<br>The government will focus on strengthening and improving governance mechanisms and institutional frameworks for efficient enforcement of environmental regulations in the country. | • Review the existing environmental regulations to identify areas for improvement. | Yet to be implemented | Short term |
| | • Identify the drivers of law enforcement. | Yet to be implemented | Short term |

### 7.4.3 Potential for job creation

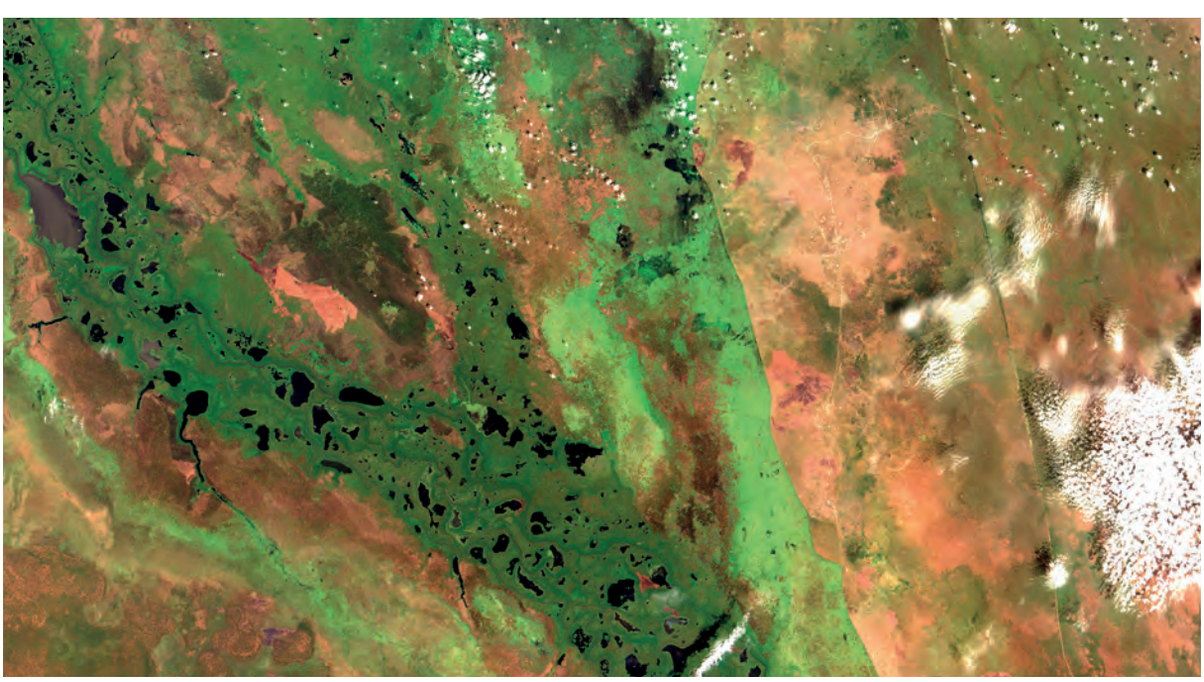
A large part of the population of South Sudan is dependent on ecosystem-based services for their livelihoods. Overexploitation of these services will compromise their livelihoods. Therefore, investing in the sustainable management and restoration of ecosystems, such as wetlands and watersheds, will not only keep these ecosystems healthy but such investments will also provide economic and social benefits to the communities dependent on these ecosystems.

Ecosystem restoration activities (including conservation activities) tend to create localized employment benefits through well paying jobs. Various studies indicate that ecosystem restoration supports an average of 33 jobs per million of United States dollars invested (but up to 39.7 jobs, depending on geographic scale and type of restoration activity) compared to only 5.2 jobs created in the oil and gas sector for similar investment. The employment multiplier of restoration activities ranges between 1.5 and 3.8 jobs, which is similar to that of various industries and agriculture and livestock sectors (BenDor et al., 2015). Therefore, investments made in conserving, restoring and sustainably managing wetlands, water catchments, forests, etc., will create employment opportunities and provide a means for sustained jobs in South Sudan while maintaining biodiversity and protecting communities dependent on these ecosystems.

## 7.5 ELECTRICITY

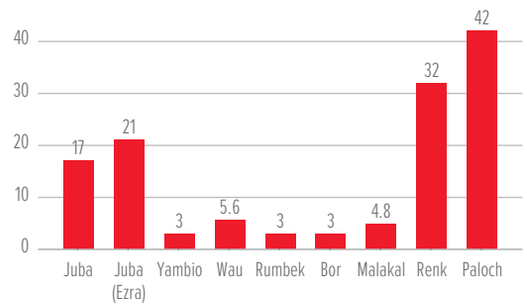
### 7.5.1 Current status

South Sudan does not have an extensive electricity generation and supply infrastructure. There is no national grid for electricity supply, forcing people to depend on diesel-powered generators for electricity. Access is low with only 3 percent of the total population having access to electricity, mainly in the capital city of Juba and the towns of Wau, Kapoeta and Malakal. Electricity demand is estimated to be 300 megawatts (MW) but, in 2018, the installed generation capacity of the country



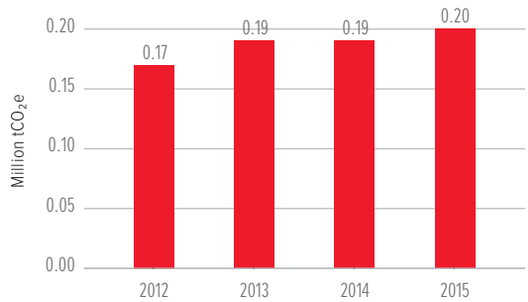
A CBERS4 satellite image of the southern part of the Sudd swamp. The black areas are open water surfaces. The brown lines crossing the image diagonally are the White Nile and tributaries. The dark green areas are flooded vegetated lowlands (mostly tall grasses and *cyperaceae* (reeds). The light green shows short grasses on higher ground and exposed soil is orange.

**Figure 30: Installed electricity generation capacity (MW) in South Sudan, 2018**



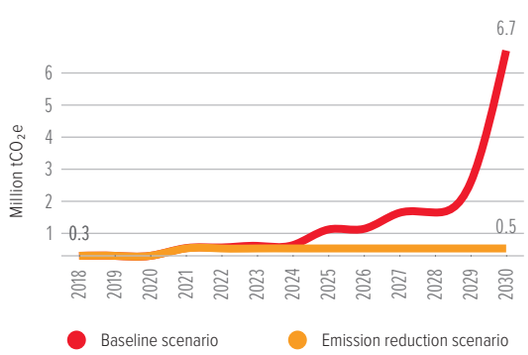

Source: Ministry of Electricity and Dams, 2018

**Figure 31: GHG emissions from domestic production of electricity, gas and water, 2012–2015**




Source: SCP-HAT, 2015

**Figure 32: GHG emission scenarios for electricity generation, 2018–2030**




was only 131.43 MW of which 42 MW is used to power the oil field at Paloch (Figure 30).

Estimated GHG emissions for the electricity sector of South Sudan are unavailable. However, data for overall emissions from domestic production of the electricity, gas and water sectors (combined) gradually increased over the period 2012–2015 (Figure 31). The emissions increased from 0.17 million $tCO_2e$ in 2012 to 0.20 million tonnes in 2015.

Although South Sudan is completely dependent on thermal power generation, it has great potential for generating electricity through renewable energy sources. Most areas of the country receive 10–12 hours of sunshine a day, with a solar potential of approximately 6.9 gigajoules per square metre per year. Currently, solar-based energy generation is insignificant in the country and it is estimated that only about 45,000 households have some form of lighting or electrical appliance powered by solar energy. South Sudan also has huge potential for hydropower, with more than 200 suitable sites for small-scale hydropower generation plants. The hydropower potential is estimated to be 4,860 MW with an annual production of 24,132 gigawatt-hours (South Sudan Ministry of Environment, 2018).

The Government of South Sudan has identified various short- and long-term strategies to develop the electricity sector and to increase the share of renewable energy in the total energy mix. The government has invested in multiple projects (including a 100 MW thermal power project in Juba and a 20 MW solar park in Nesitu), which are expected to be completed by 2021. Once completed, these projects are expected to increase total installed capacity to 251.43 MW (from 131.43 MW) and increase the share of renewable energy to 8 percent in the total energy mix.

### 7.5.2 Emission reduction potential

Electricity demand in South Sudan is expected to increase from 300 MW to 1,450 MW by 2035. To meet this growing demand, South Sudan has identified multiple electricity generation projects and the associated investment requirements. Using this information, two scenarios have been developed for estimating the emission reduction potential of the electricity sector and are illustrated in Figure 32.

**Baseline scenario:** The baseline emission scenario estimates GHG emissions from the electricity generation sector based only on the existing strategies and projects that have already been implemented in South Sudan (i.e., a 20 MW solar power plant is considered in this scenario). The emission trajectory does not reflect any new renewable energy policies or financing that might be implemented in the sector. Thus, the baseline scenario assumes that beyond 2021, only oil-based power plants will be installed for electricity supply. Under this scenario, the share of renewable energy in the total installed capacity would be less than 1 percent in 2030. Greenhouse gas emissions in the baseline scenario are estimated to increase from 0.2 million $tCO_2e$ in 2018 to 6.7 million $tCO_2e$ in 2030.

**Emission reduction (ER) scenario:** The emission reduction scenario assumes that any new power-plant installation will be based on renewable energy only; no power plants that use carbon-based fossil fuels will be installed beyond 2021. The emission reduction scenario takes into account all the projects and investments that are planned by the Government of South Sudan to estimate the total installed capacity of renewable energy in the country by 2030. Thus, the emission reduction scenario is based on the following:

- Over the next 10 years, six hydropower plants that have been planned by the government, will be installed: Fula hydro (1,800 MW), and small hydropower plants in Shukoli (210 MW), Beden (400 MW), Lakki (210 MW), Sue (12 MW) and Kentti (3.5 MW).
- Investments of $500 million will be made for solar-based power generation, which translates to 57 MW (at the cost of $1 per kilowatt-hour; Mozersky and Kammen, 2018) of new solar-powered plants installed by 2030.
- Investments of $100 million will be made for power generation using wind energy, which translates to a total of 11.41 MW (at the cost of $1 kilowatt-hour; Mozersky and Kammen, 2018) by 2030.
- Investments of $1.5 million will be made for biogas-based power generation, which translates to 5.7 MW (at the cost of $30 per megawatt-hour; International Energy Agency, 2020) by 2030.

In the emission reduction scenario, the share of renewable energy will be more than 92 percent including hydropower plants (but 3 percent excluding hydropower) by 2030. Greenhouse emissions in 2030 are estimated to be 0.53 million $tCO_2e$, 92 percent lower than the baseline scenario (Figure 32, page 95). Thus, the emission reduction scenario will achieve a cumulative emission reduction of 11.9 million $tCO_2e$ by 2030 compared to the baseline scenario.

The strategies that will be implemented to achieve the targets for emission reduction in the electricity sector are detailed in the section below.

### 7.5.3 Key strategies

#### *7.5.3.1 Mitigation*

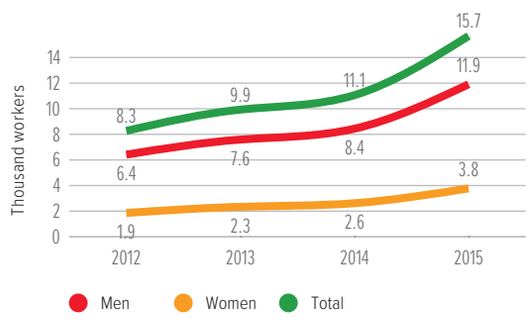
Electricity demand in South Sudan is expected to rise above 1,450 MW by 2035. As estimated above, heavy reliance on fossil fuels for power generation to meet this demand will result in significant emissions from the sector. Given the increasing demand and South Sudan's high potential for electricity generation from renewable sources, there is significant room for green growth in this sector. Thus, South Sudan will implement the following strategies (described in Table 18) to achieve emission reductions in electricity generation.

**Table 18: Mitigation strategies for the electricity sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Increase the use of clean and renewable energy.**<br>South Sudan will continue to increase the use of clean energy and would aim at improving the share of renewable energy in its total energy mix by utilizing South Sudan's high potential for solar (6.9 gigajoules per square metre per year) and wind (285–380 watts per square meter) energy generation. Increases in renewable energy for power generation will not only reduce emissions in the electricity generation sector, but these will also enable low-carbon development of most of the other secondary sectors (such as public administration, education, health services and business activities that require electricity for operations). | • Install Fula hydro (1,800 MW) and small hydropower plants in Shukoli (210 MW), Beden (400 MW), Lakki (210 MW), Sue (12 MW) and Kentti (3.5 MW). | Feasibility study for Grand Fula, along with environmental impact assessment, has been carried out. | Medium to long term |
| | • Install wind turbines in Eastern Equatoria, Greater Upper Nile and Jonglei states. | Yet to be implemented | Medium to long term |
| | • Install a 20 MW solar photovoltaic plant to supply electricity to Juba. | Engineering, construction and procurement work for the plant is ongoing. | Medium to long term |
| | • Promote the environmentally sustainable use of biogas for electricity generation. | Yet to be implemented | Medium to long term |
| **Improve the efficiency of biomass use.**<br>South Sudan will focus on improving energy efficiency in the use of biomass, in particular, fuel wood and charcoal in the traditional energy sector. | • Design improved cooking stoves to achieve energy-efficient cooking systems. | Awareness-raising campaigns on the economic use of biomass have been conducted. | Short to medium term |
| **Reduce carbon intensity of existing power plants.**<br>South Sudan will encourage a reduction in emissions from existing fossil-fuel power plants. | • Assess the emission intensity of existing thermal power plants. | The Azra independent-power-producers, 33 MW heavy-fuel-oil diesel plant has been notified to calculate emission levels. | Short to long term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Improve electrification in rural areas using decentralized grids.**<br><br>South Sudan will focus on improving electrification in rural areas through solar photovoltaic distribution. The country will also make use of mini-grids or decentralized renewable energy grids, which can be a time and cost-efficient measure for providing access to electricity until a centralized grid is installed. Timely and affordable access to energy would reduce the opportunity costs associated with improved livelihood options and will be fundamental for South Sudan to meet its goals under Sustainable Development Goal (SDG) 7: Affordable and Clean Energy. | • Sign a memorandum of understanding with investors for rural, solar photovoltaic projects in each of the ten states in the country. | Currently, this activity is stalled due to security concerns and inter-communal conflicts. | Medium to long term, depending on improvement in internal security conditions |
| **Increase renewable energy to access climate finance.**<br><br>An increase in the contribution of renewable energy in the electricity mix will also enable South Sudan to access international climate finance through market-based mechanisms (such as carbon markets or result-based climate finance). | • Participate in carbon markets to trade offsets generated from renewable energy projects. Offsets can be traded not just globally, but also regionally (African countries such as Ethiopia have started building domestic emission trading schemes). | Yet to be implemented | Medium to long term |
| **Improve energy efficiency in the formal energy sector.**<br><br>South Sudan will focus on increasing the efficiency of electricity usage in the formal energy sector and will promote optimal usage of hydropower by careful management of water resources. | • Improve energy efficiency of lighting and appliances for power saving. | South Sudan is a member of the East African Centre of Excellence for Renewable Energy and Efficiency.<br><br>Progress has also been made by including South Sudan on the priority list by the Nile Equatorial Lakes Subsidiary Action Program to develop mini hydropower plants as part of the rural electrification project. | Short to medium term |
| **Construct a national grid and interconnected transmission lines.**<br><br>Currently, South Sudan does not have a national grid, therefore construction of central grid and transmission and distribution infrastructure is a priority area for the country. The government has also planned to construct interconnected transmission lines with Sudan, Uganda and Ethiopia. | • Conduct feasibility study for the construction of national grid. | Yet to be implemented | Medium to long term |
| | • Conduct feasibility study for the construction of transmission lines with neighbouring countries. | Yet to be implemented | Medium to long term |

**Figure 33: Employment in the electricity, gas and water sectors, 2012–2015**




Source: SCP-HAT, 2015

### 7.5.4 Potential for job creation

Similar to GHG emissions, employment data for the electricity sector in South Sudan are unavailable. However, SCP-HAT provides total employment in combined electricity, gas and water sectors (Figure 33). Employment continuously increased for the period 2012–2015 with a compound annual growth rate of 24 percent. Employment for men and women observed an increasing compound annual growth rate of 23 percent and 27 percent, respectively.

Employment in the electricity sector is expected to continue growing in the future with an increasing share of renewable energy in the total energy mix. This is because renewable energy technologies tend to be more labour intensive than conventional energy generation, and create more jobs per unit of energy produced. Examples from developed countries also suggest an increasing employment trend in the renewable energy sector. For instance, employment in clean energy in the United States grew by 3.6 percent in 2018, adding about 110,000 new jobs. Moreover, it is estimated that the United States' two fastest growing jobs to 2026 will be those of solar installers (105 percent growth) and wind technicians (96 percent growth) (Marcacci, 2019). Furthermore, recent studies show that renewable energy projects can offset job losses from a decline in extractive industries and can, in turn, create a net employment gain (International Labour Organization, n.d.).

With regard to gender representation in the renewable energy sector, women currently represent 32 percent of the renewable energy workforce globally, which is higher than the 22 percent average reported for the oil and gas industry (International Renewable Energy Agency, 2019). Therefore, increasing the share of renewable energy in South Sudan will be pivotal to job creation and, if the dividend of this growth is equally distributed, it can provide increased career development opportunities to both men and women.

## 7.6 WATER

### 7.6.1 Current status

South Sudan's water resources are distributed unevenly within the country, both spatially and temporally. Quantities of water vary significantly between years, depending on major floods and drought events. Due to its relatively small population and limited industrial development, water demand is low in South Sudan compared to its neighbouring countries. However, demand is expected to rise significantly with increasing population and industrial activities. The Ministry of Water Resources and Irrigation reported, in 2007, that the impact of human activities on the quantity and quality of water resources was already evident and of growing concern. Moreover, it has been observed that once-perennial rivers in South Sudan are becoming seasonal. Climate change is likely to exacerbate this problem, impacting water availability and reliability.

Another critical issue in South Sudan is the absence of wastewater management infrastructure. Untreated municipal wastewater, sludge and industrial effluents run directly into water bodies, since most towns lack water treatment and adequate sanitation facilities. Only 13 percent of the population had access to sanitation facilities in 2017. This makes the communities, especially in rural areas, vulnerable to water-borne diseases and in 2017, for instance, more than 16,000 people were affected by a cholera outbreak, with a mortality rate of 2.3 percent (World Health Organization (WHO), 2017).

Around 50 percent of the population in South Sudan does not have access to safe drinking water (USAID, 2017). Most of the urban population (except in Juba and other state capitals) are dependent on undeveloped water supply systems similar to those of rural areas, such as water yards, motorized community handpumps and unprotected wells. Thus, the major policies of South Sudan, i.e., the NAPA, the NDS and Vision 2040, focus on improving drinking-water accessibility and conserving natural water resources.

### 7.6.2 Emission reduction potential

Emissions from the water sector come mainly from the use of electricity for collection, treatment and distribution of water to residential and commercial sectors (represented in Figure 31). The low-carbon development of these services is directly dependent on the use of renewable energy and the low-carbon development of the electricity sector. Thus, water being a secondary sector, its emission reduction potential has already been accounted for in the electricity sector (refer Figure 32, page 95).

### 7.6.3 Key strategies

#### *7.6.3.1 Mitigation*

To maintain water quality and reduce the transmission of water-borne diseases, it is important to ensure that untreated wastewater is not directly discharged into water bodies. This can be achieved through implementation of the strategies described in Table 19.

**Table 19: Mitigation strategies for the water sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Development of water supply infrastructure.**<br>To ensure access to safe drinking water and to enhance water resources management practices, South Sudan will invest in establishing efficient water supply infrastructure. | • Finalize the draft Water Bill.<br>• Ensure coordination between national, transboundary and international water-sector activities. | No progress has been made due to lack of financial resources. | Short to medium term |
| **Develop wastewater treatment infrastructure.**<br>South Sudan will invest in developing and improving urban and industrial wastewater treatment infrastructure to improve water quality. | • Implement the urban water development project supported by the Japan International Cooperation Agency (JICA). | Yet to be implemented | Medium term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Promote the reuse and recycling of wastewater.**<br>The government will promote the reuse and recycling of wastewater to reduce environmental impact and stress on freshwater resources. | • Encourage recycling of industrial wastewater. | Yet to be implemented | Medium term |
| **Develop regulations to reduce water pollution.**<br>South Sudan will develop and implement mechanisms such as penalties for industries and/or individuals responsible for polluting water sources. | • Impose and collect fines or penalties for polluting freshwater resources. | Not yet implemented | Short term |

To implement the interventions provided in Table 19, South Sudan will require increased access to climate and development finance to set up adequate water management infrastructure. This will also help South Sudan to meet its goals under SDG 6: Clean Water and Sanitation.

### *7.6.3.2 Adaptation*

Table 20 showcases adaptation actions that will be taken in order to reduce the adverse impacts of changing water availability and water quality on communities.

**Table 20: Adaptation strategies for the water sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Rehabilitate irrigation schemes.**<br>The majority of South Sudan's population is dependent on agriculture and livestock for their livelihoods. These communities are highly vulnerable to climatic changes that impact water availability and quality. Therefore, South Sudan aims to rehabilitate irrigation schemes to provide improved access to water for agriculture. | • Rehabilitation of northern Upper Nile State irrigation infrastructure to benefit about 20% of all the farmers in the area by 2030. | No progress has been made due to the lack of financial resources. | Short to long term |
| **Develop water infrastructure to support livestock farming.**<br>South Sudan aims to establish rainwater-harvesting measures for livestock production to reduce vulnerability of cattle keepers and pastoralist communities in water-scarce regions. | • Construct and rehabilitate water-harvesting and storage infrastructures (such as *haffirs* and pans) and develop flood-control works (such as barriers and dykes). | Not yet implemented | Short to medium term |
| **Conserve wetlands.**<br>South Sudan has many important wetlands that support the livelihoods of a large number of people (especially through fishing and extracting timber) and, in some cases, supply communities with water. These wetlands are vulnerable to changes in temperature and precipitation, as well as over-extraction. Therefore, protection of these wetlands is another important focus area. | • Generate awareness among government and institutions for sustainable wetland management practices. | Yet to be implemented | Short term |
| | • Build the capacity of communities living around wetlands to adapt and diversify their livelihoods, thereby preventing excessive exploitation of wetland resources. | Yet to be implemented | Short term |

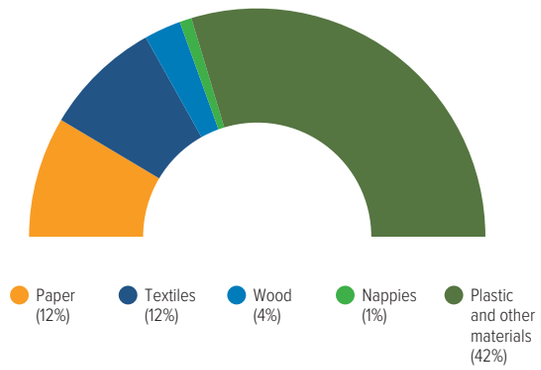
| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Implement projects identified under water-related policies that incorporate climate-change criteria.**<br>The government will put in efforts towards implementing and executing projects that are included in the CAMP and the Irrigation Development Master Plan. Moreover, climate-adaptation criteria will be incorporated in public investment in these water-related projects. | • Review projects identified in the agriculture and irrigation master plans to consider likely impacts of climate change in project planning and implementation. | Yet to be implemented | Short to medium term |
| | • Implement the planned Jebel Lado Irrigation Scheme. | The government is currently setting up an agreement with the World Bank. | Short to medium term |
| **Rehabilitate the hydrometeorological monitoring network.**<br>South Sudan will invest in establishing and rehabilitating hydrometeorological monitoring stations to collect climate information and provide early warnings for events such as floods and droughts. | • Strengthen and upgrade the operations of the Water Information Management System for collecting and monitoring water-related information. | Yet to be implemented | Medium term |
| | • Rehabilitate existing water pumps and install new pumps. | Yet to be implemented | Medium to long term |
| **Introduce integrated water catchment management.**<br>To maintain water quality and quantity for the future, the Government of South Sudan is prioritizing an integrated water catchment management approach. This involves recognizing the complex relationships between existing ecosystems, hydrology and human dependencies on these resources to identify and adopt measures for sustainably managing and reducing threats to water resources. | • Implement the Nyimur Multipurpose Water Resources Project to improve socio-economic development through water resources management for increased water availability. | A study for project implementation has been carried out. | Short to medium term |

### 7.6.4 Potential for job creation

Jobs in the water sector serve as building blocks for a wide array of water-dependent job opportunities in sectors such as agriculture, fisheries, energy, mining and industry. Access to safe drinking water for households and commercial sectors, along with adequate hygiene, is crucial for maintaining a healthy and productive workforce across all sectors. Thus, investment in water-related infrastructure is not only necessary for creating jobs in the sector directly, but is also critical in providing an enabling environment for economic growth and employment generation in other water-dependent sectors.

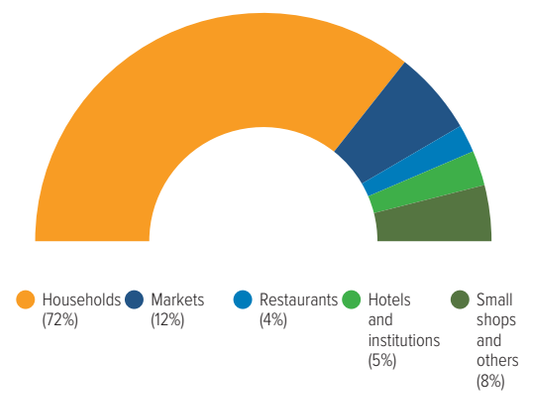
Estimating the potential of economic growth and direct job creation is particularly challenging for the water sector due to the current unavailability of data on jobs that are dependent on water. However, there are few studies that find a strong positive correlation between investments in the water sector and national income, as well as between water storage capacity and economic growth (UNESCO, 2016). For instance, investment in small-scale projects in Africa that focus on increasing access to safe water and basic sanitation could potentially provide an estimated economic return of about $28.4 billion per year (UNESCO, n.d.). These high economic returns will have positive impacts on direct and indirect employment as well. If the planned NDC interventions for the water sector are implemented in a coordinated manner in conjunction with those for other sectors (i.e., agriculture, energy and industry), South Sudan could maximize positive economic and employment benefits.

**Figure 34: Composition of municipal solid waste in Juba**



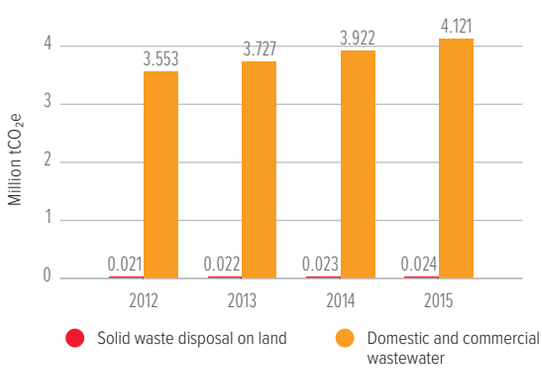

Source: JICA, 2018

**Figure 35: Sources of solid waste in Juba**




Source: South Sudan Ministry of Environment, 2018

**Figure 36: GHG emissions from the waste sector, 2012–2015**




Source: South Sudan Ministry of Environment, 2018

## 7.7 WASTE

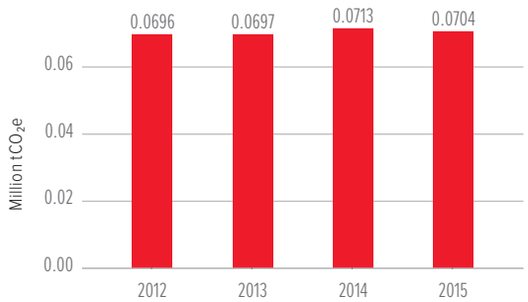
### 7.7.1 Current status

Currently, the waste management system of South Sudan is inefficient and underdeveloped. There are no national level policies or strategies that have been implemented for waste management in the country. Most of the waste that is generated either goes to landfill sites or is openly burned. The city of Juba generates approximately 1,337 tonnes of solid waste per day, which breaks down to a daily per-capita waste of 0.68 kilograms made up mostly of plastics and food waste (Figure 34). Figure 35 shows that much of this waste comes from households (72 percent) followed by markets (11 percent). In Juba, the city council, collects 34.3 tonnes of waste a day (2.6 percent of the total waste generated), indicating low coverage of waste collection services (JICA, 2018). The remaining waste is disposed by households, most of which is illegally dumped along riverbanks, in vacant spaces or burned in open air.

In addition to a low waste-collection ratio, South Sudan does not have large waste processing or recycling industries. Informal collection of waste materials such as aluminium, scrap metal, hard plastic and plastic bottles is carried out. These materials are exported to Uganda and Kenya for recycling by small-scale private companies.

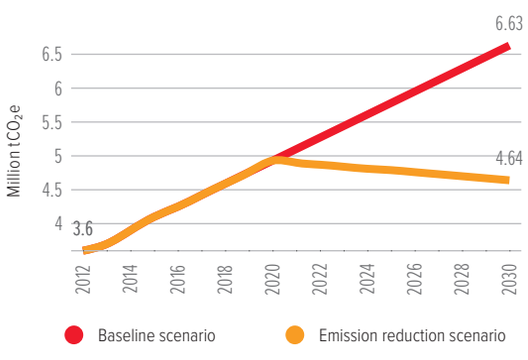
There are no recycling or wastewater treatment plants and sewer systems in the country. Municipal wastewater, sewage and industrial effluents run directly into natural water bodies due to the lack of sanitation and wastewater management infrastructure. This contaminates surface waters and groundwater resulting in serious health risks to local communities. Unmanaged and untreated waste not only impacts human and ecosystem health, but also results in high and increasing GHG emissions (Figure 36). According to the NATCOM, the waste sector contributed 11 percent (4.1 million $tCO_2e$) to the country's total GHG emissions in 2015 (South Sudan Ministry of Environment, 2018). The major GHG emissions from the waste sector are landfill-generated methane and wastewater-generated methane and nitrous oxide.

**Figure 37: Domestic production of GHG emissions from recycling, 2012–2015**




Source: SCP-HAT, 2015

**Figure 38: GHG emission scenarios for the waste sector, 2012–2030**




Greenhouse gas emissions from domestic recycling, however, did not increase over the 2012–2015 period (Figure 37). Instead, there is a slight decrease of emissions (by 1 percent) between 2014 and 2015. Recycling of waste material contributed marginally, 0.1 percent (0.07 million t$CO_2$e), to the total domestic production of GHG emissions in 2015.

A lack of effective waste management infrastructure and policies has led to waste becoming a major environmental problem in South Sudan. To address these issues, the Environment Protection Bill requires the Ministry of Environment and Forestry to issue guidelines on solid and hazardous waste management. Moreover, the government developed the Solid Waste Management Plan for Juba (city) with technical support from JICA. The city declared a target collection rate of 34 percent by 2023, and to strengthen the capacity of solid waste management. However, due to lack of budget and the rapid population increase in the city, the plan is not making progress as scheduled (JICA, 2018).

### 7.7.2 Emission reduction potential

To estimate the potential for GHG emission reduction from the waste sector, two scenarios have been developed, and projections made for the years 2016–2030. The two scenarios are described below and illustrated in Figure 38.

**Baseline scenario:** The baseline emission scenario projects GHG emissions for the waste sector based only on the existing policies in South Sudan. The emission trajectory does not reflect any new policies or financing that

might be implemented in the sector; i.e., the baseline scenario represents the case of no action. Projections for the amount of waste generated are based on population growth rate and urbanization. Under this scenario, emissions from the waste sector continually increase and reach 6.6 million $tCO_2e$ by 2030.

**Emission reduction scenario:** The emission reduction scenario represents a decarbonization pathway for South Sudan, in which the government implements policies such as landfill methane recovery, increased recycling and incineration. The emission reduction target in this scenario is based on estimates of the IPCC, which suggest that the waste sector has a potential of mitigating 30 percent of its emissions by 2030, compared to the baseline levels (Figure 38). Under this scenario, emissions from the waste sector are estimated to be 4.6 million $tCO_2e$ by 2030, which results in a cumulative emission reduction of 10.9 million $tCO_2e$ (19 percent lower) by 2030 compared to the baseline scenario. The strategies that will be implemented to achieve the emission reduction targets for the waste sector are detailed in the section below.

### 7.7.3 Key strategies

#### *7.7.3.1 Mitigation*

The following table showcases mitigation actions that will be taken up in order to ensure proper management and treatment of waste and reduce GHG emissions.

**Table 21: Mitigation strategies for the waste sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Develop national-level waste management policy.**<br>There are minimal regulatory systems for effective waste management and for regulating waste management activities in South Sudan. Therefore, the foremost focus of the government would be development and implementation of a national-level policy and plan for waste management. A major aspect of this policy will be to enable transition towards a circular economy by promoting the use of waste as a resource and enhancing recycling rates. This will help South Sudan reduce primary material extraction and increase the use of secondary sources. | • Develop a national-level plan for solid and liquid waste management with a focus on a circular economy. This plan could be implemented at state level first and subsequently cascaded down to each municipality. | Yet to be implemented | Short to medium term |
| | • Increase awareness and disseminate information regarding waste management among communities at national, state and county levels. | Yet to be implemented | Short to medium term |
| **Increase private-sector participation.**<br>Currently, there is minimal participation of private players in the waste management sector, with major responsibilities lying with the municipality. Therefore, an important aspect of the waste management plan would be to encourage involvement of private sector in waste management activities. This would ensure improved coverage of waste collection and management services. | • Increase awareness regarding the global carbon markets and associated climate finance among private players. (Waste management is one of the potential sectors for generating carbon credits. Thus, implementation of efficient waste management practices can reduce GHG emissions and potentially generate emission-reduction credits in carbon markets. The revenue generated from the sale of such carbon credits can provide economic incentives to private players for development and implementation of effective mitigation technologies.) | Yet to be implemented | Short to long term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Reduce, reuse, recycle to minimize waste and use waste as a resource.**<br><br>To transition from a linear to a circular economy, South Sudan will promote waste prevention, minimization, recycling and reuse in various sectors such as agriculture, hospitality, construction and industry. This represents a growing potential to reduce GHG emissions through decreased waste generation, not only in the waste sector but in other sectors as well. | • Promote waste prevention from different sectors by utilization of urban waste for making briquettes; plastic waste to generate refuse-derived fuel, which could be used in industry; methane capture during flaring for biogas electricity-generating plants; and reuse and recycle construction material, such as wood, bricks, iron, etc. | Yet to be implemented | Short to medium term |
| | • Create green belts in sewage treatment sites. | These plans are included in the NDS as priority actions. | Medium to long term |
| | • Procure compactors, excavators, dumper trucks and shredders to manage waste disposal; train staff to manage waste facilities. | | Short term |
| | • Establish laboratories to test quality of water resources and wastewater. | | Short to medium term |
| **Regulate the extraction of primary resources.**<br><br>South Sudan will regulate the extraction and use of primary sources to catalyse an adoption of waste recycling. | • Reduce supply of primary resources to increase demand for recycled or reused resources. | Yet to be implemented | Medium to long term |
| **Promote composting of organic waste.**<br><br>Large quantities of organic waste are generated in the country, for instance, food waste (29%) and wood waste (3.8%), which form a significant portion of municipal solid waste in Juba. South Sudan thus will promote the composting of organic waste as a circular economy strategy. Depending on the compost quality, it could have many potential applications, such as manure in agriculture and production of biogas for cooking and lighting. | • Enhance composting by mandating segregation of waste (at source) to enable composting of segregated organic waste from markets, hotels, restaurants, households and sewage sludge. | Yet to be implemented | Short term |
| | • Increase awareness on the generation of carbon credits through composting and the associated economic incentives. | Yet to be implemented | Short to medium term |
| **Development of urban and industrial wastewater treatment plants.**<br><br>Most GHG emissions from the waste sector come from domestic and commercial wastewater. Therefore, South Sudan will target the development of wastewater treatment and effluent treatment plants to reduce GHG emissions. Efficient implementation of wastewater treatment will also promote water conservation by preventing pollution and reducing the volume of pollutants flowing into water bodies. In this regard, access to international technology will be paramount due to limited domestic manufacturing facilities. Thus, to a great degree, the achievement of these particular goals for wastewater management will be conditional on receiving international financing and technology. | • Construct solid and liquid waste management facilities in Juba, Wau and Malakal. | The plan has been included in the NDS as a priority action. | Medium term |
| | • Access international technology, for example, zero liquid discharge technology. | Yet to be implemented | Medium term |
| | • Build capacity on the use of international technology extensively. (Capacity-building will be crucial since experiences in other countries, such as India, have shown that technology implementation without requisite knowledge is likely to be unsuccessful.) | Yet to be implemented | Short to medium term |

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Introduce decentralized waste management options.**<br>South Sudan will also explore decentralized waste management options, especially in rural areas. | • Introduce decentralized waste management options, such as using livestock waste for biogas generation, which could be further used for cooking and lighting in households; and installation of pit latrines, decentralized wastewater treatment systems, septic tanks, etc. | Yet to be implemented | Short to medium term |

### *7.7.3.2 Adaptation*

The following table showcases adaptation actions that will be taken up in order to ensure proper management and treatment of waste.

**Table 22: Adaptation strategies for the waste sector**

| Strategies | Activities under consideration | Current progress | Time-frame |
|---|---|---|---|
| **Improve access to sanitation facilities and improve urban sanitation practices.**<br>In South Sudan, access to basic sanitation facilities is low, especially in rural areas where only 6% of the rural population uses basic sanitation services. Development of solid and liquid waste management facilities will strengthen local communities' coping capacities by ensuring clean and hygienic surroundings and by reducing the likelihood of health impacts to communities that could arise during floods due to the prevalence of unhygienic practices. | • Include housing infrastructure in new urban planning centres. | Yet to be implemented | Medium term |
| **Development of small or decentralized wastewater treatment systems.**<br>Development of small or decentralized wastewater treatment systems would improve access to sanitation facilities while reducing water pollution and vulnerability to water-borne diseases and associated health impacts. | • Develop septic tanks for decentralized waste treatment. | Yet to be implemented | Short to medium term |
| **Improve the performance of waste management facilities.**<br>South Sudan will improve the efficiency of solid and liquid waste management facilities to ensure proper treatment and disposal of waste, thus reducing land and water pollution. | • Establish solid and liquid waste treatment plants and develop laboratories for testing treated waste. | A plan included in the NDS. | Medium to long term |
| **Establish an integrated waste management system.**<br>South Sudan will target sustainable management of waste by taking into account all sources, treatment, disposal and recycling, with an emphasis on waste prevention and increasing the efficiency of resource use. | • Map stakeholders involved in solid and liquid waste management at all levels of government. | Yet to be implemented | Short to medium term |

### 7.7.4 Potential for job creation

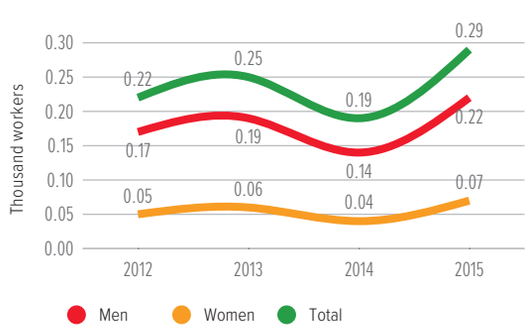
Currently, the majority of waste management activities are carried out by the informal sector in South Sudan, so overall employment trends in the sector are not available. However, employment data for recycling in the country (recycling of metal waste and scrap) saw an overall positive growth rate between 2012 and 2015 (Figure 39), with a compound annual growth rate of 10 percent. This positive rate was reflected for men and women at 9 percent and 13 percent, respectively.

Formalizing the waste sector will generate opportunities for increased formal employment and will ensure higher wages for unskilled workers. Implementation of waste management policies will increase the demand for waste management services in South Sudan.

While solid waste management is a highly mechanized process that requires minimal labour, recycling of waste is a highly labour-intensive process. Thus, high job-creation potential in the waste sector will be mainly driven by the recycling industry. It is estimated that waste collection and landfill disposal create less than one job per 1,000 tonnes of waste managed, while collection, processing and manufacturing of products from recycled materials create 6–13 jobs per 1,000 tonnes of waste recycled (National Resources Defence Council, 2014).

Thus, the implementation of waste management policies (mentioned above) in South Sudan with a focus on enhancing recycling rates would create job opportunities in the sector.

**Figure 39: Employment in recycling, 2012–2015**




Source: SCP-HAT, 2015

## 7.8 TOURISM AND RECREATION

### 7.8.1 Current status

South Sudan has numerous tourist destinations, including a wide variety of flora and fauna, and diverse cultural and historical sites. The country has 14 national parks and protected areas and is home to the world's second largest animal migration (UNEP, 2018a). Besides wildlife-based attractions, South Sudan has many rivers and wetlands, including the Sudd, which is the most extensive wetland in the Nile River basin. These tourist sites are an important source of carbon sequestration, watershed protection and biodiversity conservation.

While data for GHG emissions from the tourism and recreation sector as a whole are not available, the data for emissions from hotels and restaurants show a gradual increasing trend from a domestic production perspective for 2012–2015. The share of GHG emissions from domestic production was 0.0036 million $tCO_2e$, contributing marginally (0.005 percent) to total domestic production GHG emissions (67.6 million $tCO_2e$). Other environmental impacts of hotels and restaurants are observed in terms of natural resource consumption, such as water, and waste generation. In 2017, hotels and institutions in Juba generated 62 tonnes per day (5 percent of total waste generated) (JICA, 2018).

### 7.8.2 Emission reduction potential

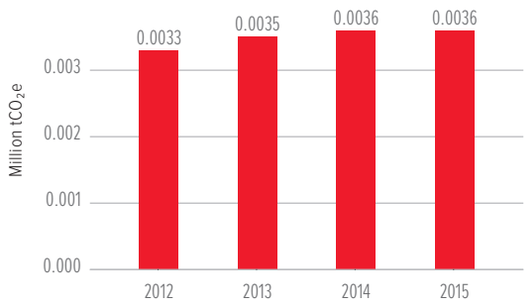
Globally, the tourism sector contributed 8 percent to emissions between 2009–2013 (Dunne, 2018). The majority of these emissions (more than 50 percent) came from aviation and road transport, followed by accommodation (World Tourism Organization, 2019). Since emissions related to domestic transport (both road and aviation) for South Sudan are accounted for in the transport sector, here the focus is only on emission reduction from the hotel industry. The tourism and recreation sector is in a nascent stage of development in South Sudan, and there are therefore limitations with respect to data availability for the sector as a whole.

Two scenarios have been developed to estimate potential emission reduction in the hotel industry, based on historical data and projections for the years 2016–2030 using a statistical model.

**Baseline scenario:** The baseline emission scenario projects GHG emissions for hotels under existing policies in South Sudan. The emissions trajectory does not reflect new policies or financing that might be implemented in the sector. Under this scenario, emissions from the sector rise by 74 percent from 2012 to reach 0.0054 million $tCO_2e$ by 2030.

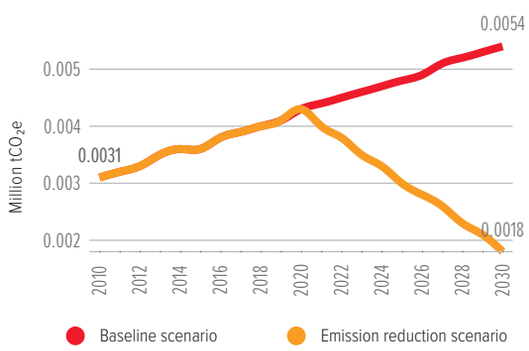
**Emission reduction scenario:** The emission reduction scenario represents the decarbonization pathway that South Sudan will have to follow until 2030 to achieve the Paris Agreement's goal of limiting global temperature rise to a maximum of 2°C. This scenario aims to reduce hotel industry emissions by of 66 percent from 2010 levels by 2030, in line with the 2°C target estimated by International Tourism Partnership for the global hotel industry (United Nations Framework Convention on Climate Change, 2018). Under this scenario, emissions from this sector are estimated to be 0.0018 million $tCO_2e$ in 2030 and there will

**Figure 40: Hotel and restaurant sector GHG emissions from domestic production, 2012–2015**




Source: SCP-HAT, 2015

**Figure 41: GHG emission reduction scenarios for the hotel and restaurant sector, 2010–2030**




be a cumulative emission reduction of 40 percent (0.02 million $tCO_2e$) by 2030.

The strategies that will be implemented to achieve the emission reduction targets for hotels have been detailed in the section below. These strategies focus on the entire tourism and recreation sector, rather than just hotels and restaurants, to ensure that as the tourism industry develops, it grows with low-carbon emissions and in a sustainable manner.

### 7.8.3 Key strategies

#### *7.8.3.1 Mitigation*

With the expected future growth of the tourism and recreation sector, the pressure on resources such as energy and water is likely to rise, as are associated GHG emissions. South Sudan will consider the strategies in Table 23 for the mitigation of GHG emissions and low-carbon development of the sector.

**Table 23: Mitigation strategies for the tourism and recreation sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Manage waste efficiently in hotels and restaurants**<br>Hotels and restaurants generate huge quantities of waste (62 tonnes per day in Juba). South Sudan will implement efficient waste management measures to help reduce GHG emissions. | • Promote composting of organic waste generated by hotels and restaurants (since most of this waste is likely to be food waste). | Yet to be implemented | Short to medium term |
| | • Utilize opportunities from composting of waste for installation of biogas units as an alternate source of energy for cooking and lighting in hotels. | Yet to be implemented | Short to medium term |
| **Increase the share of renewable energy**<br>South Sudan will focus on increasing the share of renewable energy and improving energy efficiency in hotels and restaurants as the sector grows. | • Promote use of energy-efficient appliances in hotels and restaurants and use of clean energy for cooking and lighting. | Yet to be implemented | Short to medium term |
| **Use low-carbon transport for tourism and recreational activities**<br>Tourism and recreation is interconnected with the transport sector, so promotion of the use of electric vehicles (EVs) and low-carbon transport will help reduce transport-related emissions in tourism and recreation as well. | • Use EVs, particularly for transit to and from airports, and using buses to pick up a large number of passengers at one time instead of individual cars. | Yet to be implemented | Long term |
| | • Use EVs for recreational transport (e.g., safaris). | Yet to be implemented | Long term |
| **Promote the use of locally produced sustainable food in the tourism and recreation sector**<br>As food production is one of the largest emitters of GHG emissions, increasing demand for locally produced sustainable food in the tourism and recreation sector will reduce GHG emissions from agriculture activities (e.g., transportation of food) and will help improve the livelihoods of farmers and rural communities. This will contribute towards achieving Target 8.9 of SDG 8: Decent work and economic growth ("By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products"). | • Promote collaboration between the local tourism industry and sustainable food producers in the country. | Yet to be implemented | Short to medium term |

### *7.8.3.2 Adaptation*

The following table showcases adaptation actions that will be taken in order to ensure sustainable growth of tourism activities.

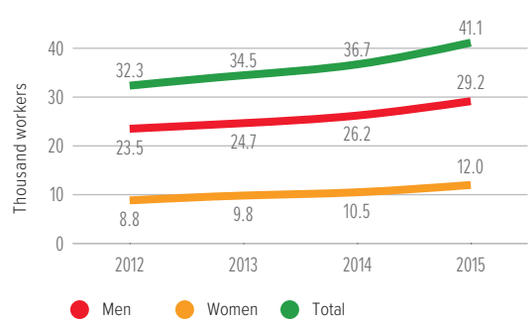
**Table 24: Adaptation strategies for the tourism and recreation sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Integrate ecotourism into existing plans.**<br>The tourism policy of South Sudan aims to promote tourism to the variety of attractions in the country, including natural forests and wildlife. If the industry develops unsustainably, it will increase pressure on natural resources and cause significant adverse impacts to wildlife, forests and ecosystems. This in turn will have an adverse impact on the livelihoods of communities that are dependent on them. Therefore, South Sudan will integrate ecotourism into existing plans, ensuring responsible travel to natural areas. | • Promote sustainable nature-based tourism, including wildlife tourism, to provide improved livelihood opportunities to rural communities while protecting biodiversity. | Yet to be implemented | Short to medium term |
| **Community-based tourism in Southern National Park.**<br>South Sudan will establish community-based ecotourism, particularly in Southern National Park. | • Engage with communities in Western Lakes and Gbudwe states for managing the park. | Yet to be implemented | Short to medium term |
| **Ensure sustainable growth of recreational activities.**<br>As its economy develops and demand for recreational activities increases, South Sudan will ensure that development of any new recreational infrastructure is climate resilient and occurs in a sustainable manner with no negative impacts on the ecosystems and biodiversity of the region. | • Development of sustainable and climate-resilient parks, gardens, water activities and other recreational infrastructure. | Yet to be implemented | Short to long term |

## 7.8.4 Potential for job creation

The tourism and recreation sector in South Sudan is currently in a phase of development. Individual entrepreneurs and a few corporates, especially from East Africa, have started building establishments for tourism. While data with respect to the number of businesses and employment are not available for the tourism and recreation sector, a few sources, such as the National Bureau of Statistics and SCP-HAT, provide data for hotels and restaurants. In 2010, 1,045 businesses (14.5 percent of total businesses) were registered

**Figure 42: Employment in hotels and restaurants, 2012–2015**




Source: SCP-HAT, 2015

as hotels or restaurants (South Sudan National Bureau of Statistics, 2010). According to SCP-HAT, employment in hotels and restaurants grew at a compound annual growth rate of 8 percent in 2012–2015. The employment rate for both men and women also increased over the same period, with a compound annual growth rate of 8 percent and 11 percent, respectively.

The potential of the tourism and recreation sector to contribute to the economic and social development of the country is significant. As the sector is linked to various others, it is a major creator of employment, particularly for women, youth, migrant workers and rural communities. The global tourism sector generates 1 in every 11 jobs in the world (International Labour Organization, 2016). There is evidence from other African countries (e.g., South Africa) that a booming tourism sector creates many more jobs than other sectors because of its labour-intensive nature. Effective implementation of initiatives like those mentioned in Chapter 7.8.3 to strengthen the sector's linkages with other sectors throughout the supply chain (e.g., transport, agriculture and promotion of locally produced goods) will enhance local employment opportunities and contribute towards reducing poverty in South Sudan.

The future growth of the tourism and recreation sector in South Sudan will also have a positive impact on women's employment, since tourism is one of the few sectors in which the participation of women is already above parity in some regions. Women account for up to 70 percent of all workers in the global tourism industry (World Bank, 2018). Furthermore, promotion and implementation of sustainable wildlife tourism strategies with effective planning, stakeholder collaboration and community participation will provide income-generating opportunities for communities that live adjacent to protected areas, especially for their women. Tourism employment will likely change the social and gender dynamics in these communities as more women become empowered.

## 7.9 MINING AND QUARRYING

### 7.9.1 Current status

South Sudan has more than 16 minerals, including gold, copper, zinc, lead, manganese, silver, tin, uranium, diamonds, tungsten, mica, iron ore, marble, limestone, dolomite, clay and asbestos. However, commercial exploration is currently constrained by the lack of industrial activity in the country, limited investments and few trained human resources.

Domestic production output in the sector has been observed to be increasing, but most of the minerals currently produced are exported to neighbouring countries. According to SCP-HAT data, domestic output increased by 1.48 percent per annum from 2012 to 2015 (from $255 million to $267 million, respectively).

Oil production, which has been the major source of revenue for the country, has been declining in recent years. The government is therefore now promoting mining and quarrying, which are focused on in South Sudan's Vision 2040, as an alternative source of revenue.

Illegal small-scale and artisanal mining for minerals like gold has been increasing, especially in the rural areas. Artisanal gold mining accounted for approximately 85 percent of the total gold extracted (about 280 million tonnes) up to 2015 (Ibrahim, 2015). The vast majority of those involved in artisanal mining are poor rural individuals for whom alluvial gold mining provides critical income to supplement their subsistence livelihoods of farming and cattle rearing. However, an increase in artisanal mining could lead to adverse environmental impacts like increased shifting of land use (from forestry to mines), deforestation, soil erosion and open dumping of waste.

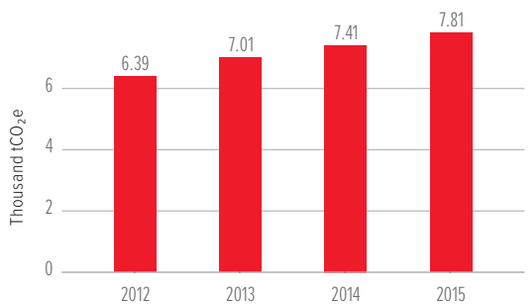
The Government of South Sudan has therefore developed a mining policy and mining act to regulate the growth of the sector and formalize mining activities, including small-scale artisanal mining. The Mining Policy recognizes the need to ensure that mining operations are conducted in a

socially and environmentally responsible manner by minimizing the harmful impacts of mining. It also ensures that the interests of local communities are considered and protected. The policy does not focus in particular on climate change mitigation and adaptation in the sector.

While small-scale mining has been formalized through the Mining Act and its regulations, illegal and damaging practices are still prevalent in the country.

This sector is not currently included in relevant climate change policies in the country. While mining and quarrying is carbon-intensive, the share of GHG emitted by the sector is low (0.01 percent of total GHG emissions in 2015, according to SCP-HAT domestic production data). However, emissions from the sector are likely to increase with further growth. Growth in the sector is also likely to lead to adverse impacts on land and water resources, as well as on biodiversity, especially if illegal small-scale and artisanal mining continues to grow.

**Figure 43: Mining and quarrying sector GHG emissions from domestic production, 2012–2015**




Source: SCP-HAT, 2015

### 7.9.2 Emission reduction potential

While South Sudan has abundant mineral wealth, it has not been extensively explored because of limited industrial activities and lack of trained human resources. Currently, the mining and quarrying industry is in a development stage and the share of GHG emissions from the sector is marginal. This makes it difficult to project the future trajectory of emissions for the sector accurately.

However, as South Sudan transitions from a low-income economy to a middle-income economy, an increase in industrial mining and quarrying is expected. As a result, GHG emissions from the

sector are expected to increase and contribute significantly to the country's overall emissions. Therefore, South Sudan, through its second NDC, commits to implementing low-carbon interventions within the sector to help reduce its negative impacts on the environment while contributing to the country's economic growth.

### 7.9.3 Key strategies

As already mentioned, the sector has significant importance from an economic development standpoint and will contribute to the growth of the country's industrial sector. This is likely to result in an increase in the amount of GHG emissions released by the sector, in addition to adverse impacts on land and water resources. South Sudan will therefore implement the interventions described in Table 25 to ensure that growth of the mining and quarrying sector occurs in an environmentally sustainable manner.

#### *7.9.3.1 Mitigation*

The following table showcases mitigation actions that will be taken up in order to ensure sustainable growth in the mining sector.

**Table 25: Mitigation strategies for the mining and quarrying sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Reduction in carbon emissions from mining activities.**<br>South Sudan will implement strategies that focus on reduction of GHG emissions from the sector through reduction of energy consumption in processes and operations. | • Promote integration of aspects of energy efficiency in the process design (during crushing and grinding) of small to large mines, and increase efficiency of energy consumption in vehicles at mining sites. | Yet to be implemented | Short to medium term |
| **Reduce deforestation due to mining.**<br>As part of its Forest Policy, South Sudan will focus on developing regulations to reduce the rate of deforestation due to mining by strengthening land-use management planning and policies at the national and local levels. | • Integrate land use management into the Forest Policy, especially for the mining sector. | Yet to be implemented | Short term |

#### *7.9.3.2 Adaptation*

The following table showcases adaptation actions that will be taken up in order to build resilience from the impacts of climate change in the mining sector.

**Table 26: Adaptation strategies for the mining and quarrying sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Strengthen governance and institutional mechanisms for the mining sector.**<br>Stronger institutional and governance mechanisms will enable strict enforcement of the policy and ensure compliance with its requirements. | • Strengthen the governance framework to ensure miners' compliance with ESIA, environment management plans and sustainable mining closure plans submitted for obtaining licenses as mandated under existing mining regulations. | Yet to be implemented | Short term |
| | • Restrict illegal small-scale mining, which is still prevalent in the country, thereby preventing negative environmental impacts. | Yet to be implemented | Short to medium term |

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Develop environmental regulations.**<br>South Sudan will develop of environmental regulations and standards for air quality, water management, and effluent and hazardous waste management at mining sites, and set up mechanisms for ensuring the regular monitoring of mining sites and compliance with regulations. This will help manage and reduce impacts on surrounding land and water resources, along with detrimental effects on the health and livelihoods of surrounding communities. | • Develop national-level plans and regulations focused on reducing negative environmental impacts resulting from mining activities. | Yet to be implemented | Short term |
| **Develop regulations to promote sustainable mine closure**<br>Develop standards for sustainable closure of mining sites and making the land usable for other purposes, such as forestry and recreation, in the future. | • Adopt globally accepted environmental health and safety standards and guidelines for covering up mine entrances, replanting grass and trees, and testing surrounding water, soil and air for contaminants, and implementing measures to prevent contamination. | Yet to be implemented | Short term |
| | • Develop strict guidelines to ensure prevention of environmental disasters due to failure of mining infrastructures such as tailings dams. | Yet to be implemented | Short term |

### 7.9.4 Potential for job creation

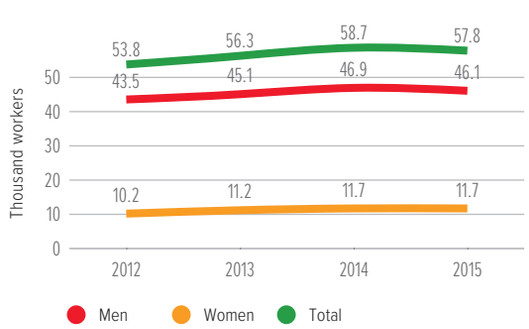
Employment in the mining and quarrying sector has been increasing at a compound annual growth rate of 2.45 percent, with a positive growth trend of employment for both men and women at 2 percent and 4.7 percent per annum, respectively.

Many people have been observed to be shifting their livelihoods from agriculture to mining. SCP-HAT data shows that employment in the agriculture sector has been decreasing by 0.7 percent per annum; this may correlate with the increase in employment in the mining sector, given that there is limited industrial development in the country and oil exploration activities have also declined.

Implementation of policies to restrict artisanal and small-scale mining will result in a large number of people who depend on informal mining activities losing employment. However, the expected growth of the mining sector and increase in formal mining activities will drive economic growth while providing local employment opportunities. In addition to direct jobs, mining creates indirect and induced jobs, the number of which could be much greater than direct jobs in mining.

Furthermore, implementation of policies such as mandatory compliance with ESIA will not only mitigate the negative environmental impacts but

**Figure 44: Employment in the mining and quarrying sector, 2012–2015**




Source: SCP-HAT, 2015

will also provide social and economic benefits to local communities that live near mine sites. Local employment in the sector can further be strengthened with government efforts to improve the competitiveness of local workers and locally produced goods and services.

## 7.10 TRANSPORT

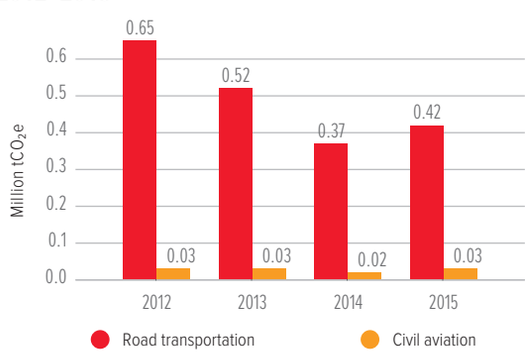
### 7.10.1 Current status

South Sudan has four main modes of transport – road, rail, river and air transport. However, these are currently neither efficient nor reliable. Road transport is the single largest mode of transport, with most goods being transported by road. However, most roads (including highways) are unpaved and are inaccessible during the rainy season due to poor maintenance. The poor infrastructure results in freight tariffs being almost four times higher than those in neighbouring countries.

Vehicle ownership remains low as a result of the country's low average income and poor road infrastructure. Most of the vehicles imported are used and old and are therefore inefficient.

South Sudan has 248 kilometres of narrow-gauge single-track railway, stretching from Babonosa in north Sudan to Wau. However, the rail network has not been operational since 2009/2010. The country has one heliport and about 85 airports, of which only three have paved runways. There are seven main river ports in the country and commercial transportation services are fairly regular along the White Nile.

**Figure 45: GHG emissions from the transport sector, 2012–2015**




Source: South Sudan Ministry of Environment, 2018

The overall cost of transporting goods remains high in South Sudan. This places a significant cost burden on transport users and suppliers and has direct consequences on the country's economy. Therefore, the Government of South Sudan is currently focusing on the development of the country's transport infrastructure (especially road transport) and the issue is also a key priority in most of the development policies of South Sudan. The NDS targets for 2018–2021 include constructing and rehabilitating 1,000 kilometres of feeder road and 500 kilometres of highway.

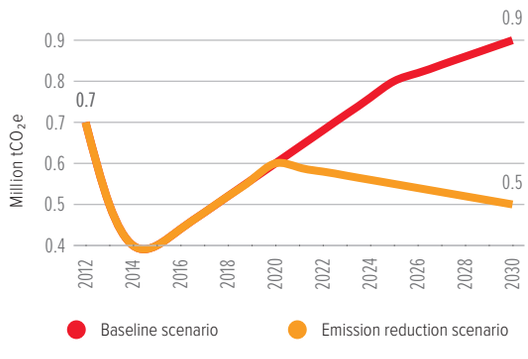
Data of GHG emissions from the transport sector show a decreasing trend from 2012 to 2014, followed by an increase of 12 percent in 2015 (compared to 2014). Transportation contributed 1.2 percent to total GHG emissions in 2015. Of this, road transport contributed to 0.42 million $tCO_2e$ (94 percent of total transport emissions) and civil aviation 0.03 million $tCO_2e$ (6 percent of total emissions). While currently the share of transport emissions is low, it is expected that it will grow rapidly as South Sudan improves its transport network for economic activities and for meeting the demands of a growing population. Therefore, there is a need to focus on mitigation strategies to ensure green growth of the sector.

### 7.10.2 Emission reduction potential

To estimate the potential of GHG emission reduction in the transport sector, two scenarios have been developed with projections for the years 2016–2030.

**Baseline scenario:** The baseline emission scenario projections of GHG emissions for the transport sector are based only on existing policies, with no new policies or financing being introduced in the sector (i.e., the baseline scenario represents a case of no action). The trajectory of emissions by this sector has been sourced from South Sudan's NATCOM, which estimates growth in fuel consumption for road transport using GDP, passenger and freight growth

**Figure 46: GHG emission scenarios for the transport sector, 2012–2030**




rates; increase in overall vehicle stock and use of vehicles; and the change in average fuel efficiency over time. In the baseline scenario, emissions from the transport sector increase gradually and reach 0.9 million $tCO_2e$ (29 percent higher than the 2012 level) by 2030.

**Emission reduction scenario:** The emission reduction scenario includes the decarbonization pathway that South Sudan will have to follow until 2030 to achieve the Paris Agreement's goal of limiting global temperature rise to 1.5°C above pre-industrial levels. Since more than 90 percent of emissions in the transport sector are from road transport, the emission reduction scenario concentrates on GHG mitigation from road transport. This scenario aims to reduce transport emissions from the baseline level by 2030, in line with the Paris Process on Mobility and Climate estimates for emission reduction required from land transport globally to achieve levels compatible with a 1.5°C scenario (Gota et al., 2016). Under this scenario, emissions from the transport sector are estimated to be 0.5 million $tCO_2e$ in 2030. The emission reduction scenario achieves cumulative emission reduction of 2.43 million $tCO_2e$ by 2030, which is 31 percent lower than the baseline scenario.

The strategies that will be implemented to achieve the emission reduction targets for the transport sector are detailed in the section below.

### 7.10.3 Key strategies

*7.10.3.1 Mitigation*

Development of the transport sector is one of the main priorities of most development strategies in South Sudan. Therefore, the sector is expected to grow rapidly and is likely to be a major contributor of GHG emissions. The government will implement sustainable and low-carbon measures (Table 27) that will support improved mobility and at the same time contribute to achieving South Sudan's emission reduction targets.

**Table 27: Mitigation strategies for the transport sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Regulate importation of inefficient vehicles.**<br>Most vehicles in South Sudan, such as cars and delivery trucks, are imported into the country. Low incomes and no age restrictions on the importation of vehicles result in the majority of imported vehicles being old and inefficient. South Sudan will therefore develop and implement import policies and strategies focusing on the type of vehicle imported to minimize emissions in the country. | • Review import policies to include criteria for types of vehicles that can be imported. | Yet to be implemented | Short term |
| **Incentivize the importation and use of EVs.**<br>South Sudan will implement measures to incentivize the importation and use of (old or new) EVs. This could either involve importing complete EVs or EV parts that can be assembled within the country. Use of EVs will help reduce GHG emissions and control air pollution levels in the country. | • Introduce tax rebate or lower import duty on EVs. | Yet to be implemented | Medium term |
| **Introduce electric railways and improve the rail network.**<br>South Sudan will invest in improving the existing rail network and will also introduce electric railways into the country. | • Specific activities will be determined over the course of NDC implementation. | Yet to be implemented | Medium to long term |
| **Develop guidelines and standards to control vehicular air pollution.**<br>South Sudan will focus on developing national ambient air quality standards or vehicular emission standards to control the problem of air pollution caused by the transportation sector. These standards can also be used as a measure to regulate the importation of old and inefficient vehicles. | • Establish exhaust testing centres: vehicles that fail tests by emitting fumes above allowable emissions levels will be subjected to mandatory repairs or scrapped. | Yet to be implemented | Short term |
| **Promote high volume transportation.**<br>The government will explore policies encouraging high volume transport options such as buses and carpooling. | • Increase awareness among the general public regarding benefits associated with using mass transportation. | Yet to be implemented | Short term |

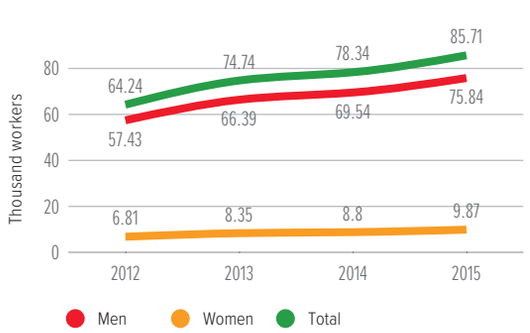
| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Coordinate the development plans of the transport and renewable energy sectors.**<br>The transport sector is directly linked to the development of renewable energy infrastructure in the country. Therefore, effective coordination mechanisms between the two sectors will be established. | • Increased deployment of EVs will contribute towards increased electrification, especially adoption of modern renewable energy systems (to mitigate emissions from power source).<br>• At the same time, RE systems, especially decentralised RE systems, need to be complemented by the use of storage in the form of batteries. The technology used for these batteries are also the same used for EVs. Thus, increased adoption of RE will lead to the establishment of battery manufacturers who can supply batteries to both RE systems as well as EVs. | Yet to be implemented | Long term |

### 7.10.4 Potential for job creation

According to SCP-HAT data, employment in the transport sector has been increasing steadily from 2012. Total employment grew at a compound annual growth rate of 10 percent in 2012–2015, with an annual growth rate in employment of men and women of 10 percent and 13 percent, respectively.

Future job creation potential will remain uncertain if adoption of EVs in South Sudan is largely dependent on imports, with no focus on local market development. Nevertheless, increasing adoption of EVs could have a positive impact on indirect and induced jobs. This is because the use of EVs will require development of adequate transport and electricity infrastructure, which will provide increased employment and career development opportunities (as discussed in the infrastructure (constructions and buildings) and electricity sections). While it is difficult to estimate the net impact of planned policies, it is likely that effective implementation strategies, such as vehicular emission standards, will generate additional jobs in automobile maintenance and exhaust testing centres.

**Figure 47: Employment in the transport sector, 2012–2015**




Source: SCP-HAT, 2015

## 7.11 INDUSTRY

### 7.11.1 Current status

Currently, most manufacturing in South Sudan is carried out by small-scale enterprises and the country is largely dependent on the importation of produced goods and services. Small-scale manufacturing of products such as potato crisps, beverages, metal products, electric motors and bricks takes place in the country. Domestic production output is highest in the electrical and machinery sub-sector, which generates 32 percent of total industrial output. This is followed by the food and beverages sub-sector, which accounted for 18 percent of total industrial output in 2015.

Since local manufacturing of goods in South Sudan is minimal, GHG emissions from domestic production are insignificant. In 2015, domestic

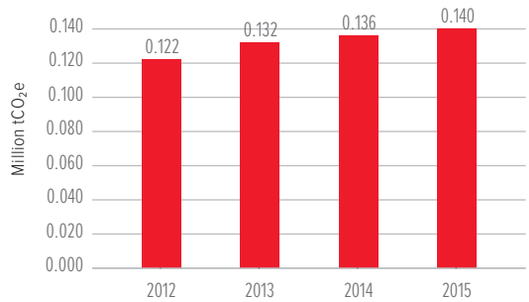
production emissions from the industrial sector were 0.14 million $tCO_2e$, 0.21 percent of total emissions. As is the case with domestic production output, most of these emissions were from the electrical and machinery, and food and beverages sub-sectors. As far as consumption is concerned, however, the industrial sector is the largest contributor to GHG emissions, indicating heavy dependence on imports. The sector's consumption contributed 39.6 percent (24.52 million $tCO_2e$) to total emissions in 2015.

As South Sudan transitions to a middle-income economy, these emissions are likely to rise with an increase in industrial activity. However, currently there are minimal to no national policies or strategies to regulate industrial activities and monitor their impact on the environment.

### 7.11.2 Emission reduction potential

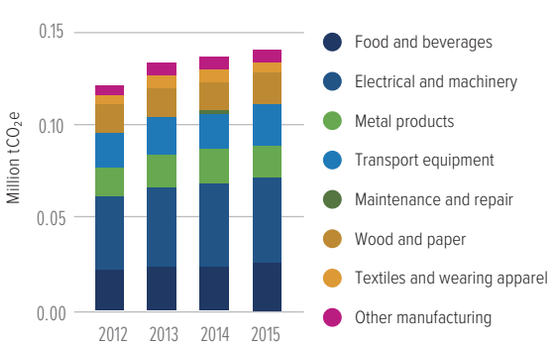
As discussed above, the industrial sector in South Sudan is currently at a nascent stage and the country is largely dependent on importation of manufactured goods and services. As a result, the share of GHG emissions from domestic industrial activities is marginal (0.21 percent of total emissions). South Sudan has minimal policies that

**Figure 48: GHG emissions of the industrial sector from domestic production, 2012–2015**

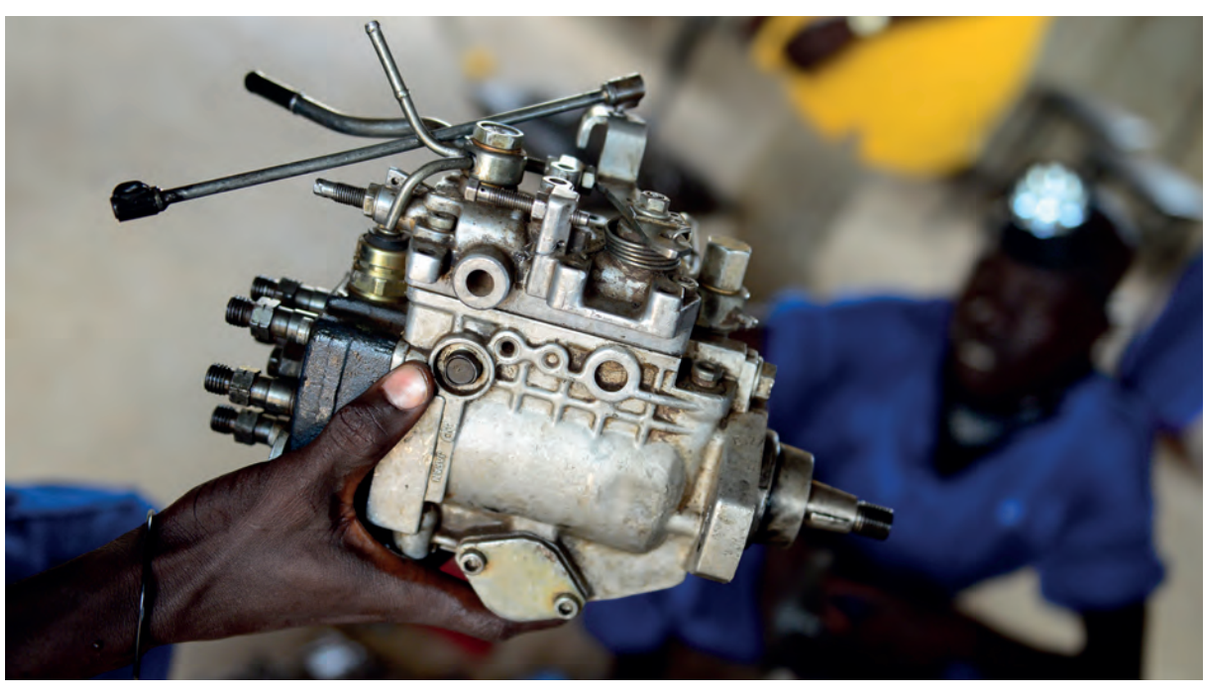



Source: SCP-HAT, 2015

**Figure 49: Share of industry sub-sectors to GHG emissions from domestic production, 2012–2015**




Source: SCP-HAT, 2015



focus on industrial development in the country and given the uncertainty of how the sector might grow in future, it is difficult to project the likely trajectory of future emissions in the sector.

However, as South Sudan transitions to a middle-income economy, it is expected to witness an increase in industrial activity. Therefore, South Sudan, through its second NDC, commits to implementing low-carbon interventions in the sector to ensure that it contributes to economic growth while adopting energy-efficient and green technologies in a timely and cost-efficient manner.

### 7.11.3 Key strategies

#### *7.11.3.1 Mitigation*

Since industry is currently at a nascent stage in South Sudan, there is room for sustainable and green growth of the sector and a number of opportunities for mitigating GHG emissions. South Sudan will focus on the implementation of the strategies described in Table 28.

**Table 28: Mitigation strategies for the industrial sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Promote importation of energy-efficient goods.**<br>Most of the emissions in the industrial sector are embedded emissions in imported goods. Therefore, a key area of focus for South Sudan is to create policies that will encourage the importation of highly energy-efficient goods. This will contribute towards decreasing the share of embedded emissions. | • Review import policies to incorporate criteria for importation of green and low-carbon products. | Yet to be implemented | Medium to long term |
| **Promote efficient waste management, particularly in the food and beverage industry.**<br>The food and beverage industry contributes significantly to GHG emissions in the industrial sector, with emissions increasing at a compound annual growth rate of 5%. This indicates that there is increased consumption of food and beverages within the country. Given the nature of the goods produced and consumed (e.g., dairy products, meat, fish, beverages, tobacco), an increase in consumption will lead to an increase in production of organic waste. Therefore, waste management in the food and beverage industry will be a priority in the country. | • Given that much of the waste generated in the food and beverage industry is likely to be organic in nature, composting of waste, particularly in this industry, will be encouraged. | Yet to be implemented | Short to medium term |
| **Promote the use of energy-efficient technologies and renewable energy.**<br>As industry in South Sudan is currently in the development stage, any future industrial development can be based on the adoption and promotion of energy-efficient technologies. This will result in more favourable costs than for a developed economy to retrofit increased efficiency. | • Promote the use of energy-efficient technologies to reduce energy requirements of industrial processes (for example, waste heat recovery from utilities such as boilers, chillers and air compressors). | Yet to be implemented | Medium to long term |
| | • Increase share of or integrate renewable energy in industrial office/building operations (captive electricity) as the industrial sector in South Sudan grows. | Yet to be implemented | Medium to long term |

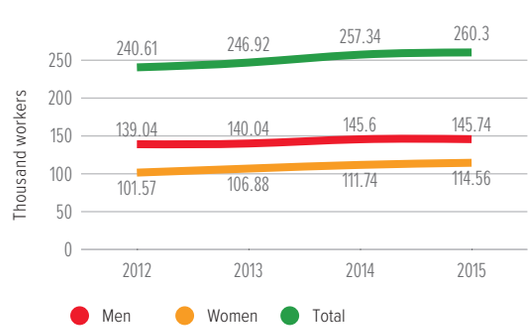
| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Promote the use of alternate sources of energy.**<br>In more energy-intensive industries or processes (such as heating equipment, boilers and kilns) fossil fuels can be replaced with alternate sources of energy. This will convert South Sudan's waste streams into usable fuel, ensuring transition from a linear to a circular economy (e.g., the cement industry would be a prime candidate for the use of refuse-derived fuel which would then contribute towards emission reductions in not just the cement sector but also the waste and construction sectors). | • Use alternate sources of energy such as biofuels and refuse-derived fuel in different sectors. | Yet to be implemented | Medium to long term |
| **Develop regulations and guidelines to reduce the negative environmental impact of industrial activities.**<br>South Sudan will develop environmental regulations to regulate the impact of industrial activities on the health of the environment and ecosystems. | • Develop standards for effluent treatment and management of solid and hazardous waste and air pollution. | Yet to be implemented | Short to medium term |

### 7.11.4 Potential for job creation

According to the SCP-HAT data, total employment in the industrial sector grew at a compound annual growth rate of 3 percent in 2012–2015, with data for both men and women showing an increasing trend in employment. Of the industrial sectors, the electrical and machinery sub-sector provided employment to the most people (38 percent of all people employed in the industrial sector).

Industrial development is an engine of economic growth and a major source of employment.

**Figure 50: Employment in the industrial sector, 2012–2015**




Source: SCP-HAT, 2015

Manufacturing industries provide employment diversification opportunities, reduce dependence on imports by enhancing productive capacity and reduce poverty. While industrial development is crucial for economic growth and job creation, there is uncertainty with respect to how manufacturing industries will grow in South Sudan. This is because structural transformation in the majority of East African countries has moved from agriculture to information and technology-based industries, tourism, etc. (Asmal et al., 2020). The labour-intensive manufacturing sectors such as textiles and apparel and leather products play a rather limited role in African countries (United Nations Conference on Trade and Development, 2013). If South Sudan also follows a similar route, bypassing manufacturing, the employment rate will be lower in the industrial manufacturing sector than other sectors like tourism, information and communications technology, education and health care services.

Given the uncertainty of how industrialization might take place in South Sudan, it is difficult to estimate future job creation potential in the industrial sector.

## 7.12 PETROLEUM, CHEMICAL AND NON-METALLIC MINERAL PRODUCTS

### 7.12.1 Current status

Oil has been the backbone of South Sudan's economy and generates about 60–80 percent of the country's revenue. However, as a result of a natural decline in oil reserves and geological challenges (increasing floods), oil production has decreased by about 62 percent in recent years, from about 325,000 barrels per day in 2011 to 123,000 barrels per day in 2017 (South Sudan Ministry of Finance and Planning, 2018).

Floods have significantly impacted oil producing capacity by covering wells with water and further slowing the production process. Production has also been affected by the ongoing COVID-19 crisis, which has increased travel costs and the time it takes to transport equipment and materials to oil fields.

Domestic production output in the sector, as per the SCP-HAT data, is observed to be decreasing by 0.42 percent per annum (from $1,484 million in 2012 to $1,466 million in 2015). While the sector's domestic production output decreased in 2012–2015, the GHG emissions from domestic production increased by 8 percent per annum.

The sector is significantly important for economic development and the government is making considerable efforts to improve its current status. Amongst these are plans to conduct studies to select the best oil wells in order to increase production. The government has also developed the National Petroleum Policy (2013) and the Petroleum Act (2012) for regulating growth in the sector. Furthermore, in October 2020 the government announced that it wants to focus on deploying technologies to track oil and allow more recovery from existing fields.

While the sector has not been included in climate policies in the country, the Petroleum Policy calls for environmental protection in the petroleum industry through environmental and social impact assessments, and environmental auditing and management planning.

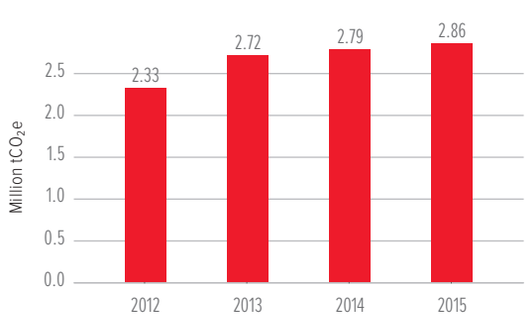
In February 2020, the government announced plans to invite bids from international companies to undertake an environmental audit to assess pollution levels and the source of pollution, and put systems in place to prevent it.

### 7.12.2 Emission reduction potential

South Sudan's economy is highly dependent on oil production and significant efforts are being made by the government to improve this sector. However, the sector is highly vulnerable to both physical and transitional climate-related risks and these factors can impact negatively on the country's oil-producing capacity and costs. Ensuring low-carbon development of the petroleum sector is critical if negative implications for South Sudan's economy are to be avoided and GHG emissions reduced.

It is estimated that oil production in South Sudan is lower than other countries. This means that the carbon intensity value to be attained to achieve the Paris Agreement's goal of limiting temperature rise to 2°C is also relatively low. According to the International Energy Agency, the carbon intensity of global energy supply will be around 20 grams of carbon dioxide per megajoule in 2050 using the 2°C scenario, while in 2015 emission intensity for South Sudan was estimated to be 8.4 grams of carbon dioxide per megajoule (58 percent lower than the International Energy Agency projection for 2050). South Sudan, through its second NDC, aims

**Figure 51: GHG emissions in the petroleum, chemical and non-metallic mineral products sector from domestic production, 2012–2015**




Source: SCP-HAT, 2015

to maintain (or further reduce) current emission intensity levels to ensure the sector contributes to the sustainable and economic growth of the country. As South Sudan also understands the importance of shifting energy consumption from conventional to renewable energy-based sources, it will focus in the long term on phasing out the use of petroleum products in the country.

The strategies that will be implemented to reduce GHG emissions from the sector are detailed in the section below.

### 7.12.3 Key strategies

*7.12.3.1 Mitigation*

In the petroleum sector, South Sudan will focus on implementing sustainable and low-carbon measures during extraction and refining processes that will reduce its emission footprint while also supporting the growth of the sector. The measures will be implemented around the areas described in Table 29.

**Table 29: Mitigation strategies for petroleum, chemical and non-metallic mineral products**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Introduce regulations to reduce emission intensity of oil extraction.**<br><br>Flaring (burning) and venting of gas is the most carbon-intensive process in crude oil extraction. Currently, natural gas in South Sudan is either flared, vented or reinjected into oil fields. Regulations and/or measures to either reduce the amount of gas flared or capture and use it will be put in place. | • Develop regulations to use/reduce the amount of gas flared. | Yet to be implemented | Short term |
| | • Invest in development of supporting infrastructure (e.g., gas pipelines) and creation of a market for supply (e.g., to industries or households) to ensure the economic feasibility of the process as well as to avoid the release of gas into the atmosphere. | Yet to be implemented | Medium to long term |

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Improve the energy efficiency of the extraction process overall.**<br>Measures to reduce energy use at operating sites will be encouraged to reduce emissions. | • Mandate the use of energy-efficient pumps and gas turbines. | Yet to be implemented | Medium term |
| | • Decrease amount of fuel consumed in transportation. | Yet to be implemented | Medium to long term |
| **Replace petroleum products with alternate energy sources.**<br>In the long term, the government will focus on gradually phasing out the use of petroleum products in the country, replacing them with alternative sources of energy. | • Use of fuels such as biofuels, refuse-derived fuel, solar and wind to replace fossil fuel in various sectors (e.g., industry, construction, hotels and restaurants). | Yet to be implemented | Long term |

### *7.12.3.2 Adaptation*

The following table showcases adaptation actions that will be taken up in order to build resilience in the petroleum sector.

**Table 30: Adaptation strategies for petroleum, chemical and non-metallic mineral products**

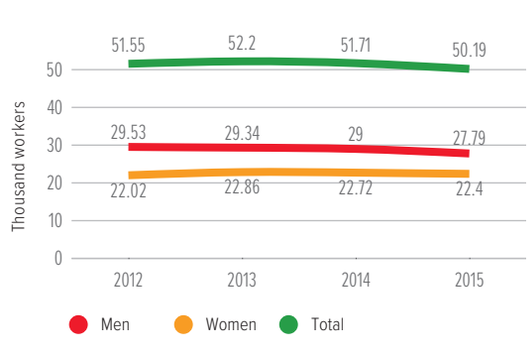
| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Construct climate-resilient infrastructure.**<br>This sector is directly impacted by climate change, particularly by flooding events when excessive water prevents access to existing oil wells, reducing their output potential. Therefore, instituting climate-resilient infrastructure planning will be a primary concern. | • Develop flood management plans and construct flood-resilient infrastructure. | Yet to be implemented | Short to medium term |

## 7.12.4 Potential for job creation

The petroleum, chemical and non-metallic product sector has witnessed a decreasing trend in overall employment, which declined at a compound annual growth rate of 1 percent in 2012–2015. Employment for both men and women decreased in 2015. One of the potential reasons for this could be the decline in the country's oil reserves, resulting in a decrease in oil production and therefore needing fewer employees. Given the role of this sector in the economic development of South Sudan, oil extraction activities will continue in the near term, and will continue to provide employment.

In the long term, achieving the 1.5°C goal will entail more aggressive decarbonization of the energy

**Figure 52: Employment in the petroleum, chemical and non-metallic mineral products sector, 2012–2015**




Source: SCP-HAT, 2015

sector, implying more rapid replacement of fossil fuel-based energy production with renewables. Thus, in the long run, phasing out the use of petroleum and oil products will result in negative impacts on jobs in the petroleum industry. According to International Labour Organization estimates, extraction of crude petroleum and services related to crude oil extraction will witness one of the strongest declines in job demand by 2030 because of transition to sustainability in the energy sector. However, employment loss in this sector will be compensated by creation of green jobs in other sectors, such as renewable energy and construction, resulting in a net positive effect on job creation (International Labour Organization, 2018b).

## 7.13 HEALTH

### 7.13.1 Current status

People in South Sudan have poor access to health care services, with only 25 percent of the population having access to health facilities. There is a shortage of medical facilities and skilled health workers and a limited supply of medical equipment and drugs. The distribution of numbers of health workers among the different states is also inequitable, with Central Equatoria having the highest number of physicians (51 percent) in South Sudan (South Sudan Ministry of Health, 2010). Because of the lack of proper health care services, preventable diseases such as malaria and acute respiratory infections are common. Food insecurity, malnutrition and lack of safe drinking water and sanitation facilities are also responsible for poor health and widespread disease (e.g., 16,706 people were affected by a cholera outbreak in 2017).

Climate change can potentially have serious implications for the already poor health status of South Sudan. Extreme weather events such as increasingly variable rainfall and floods can heighten the risk of water-borne diseases and physical injury. Malaria cases in the country have seen an increasing trend (from 323,113 cases in July–September 2011 to 359,741 in July–September 2012) during the peak rainy season in the country. Deaths in the country due to malaria accounted for about 1,300 cases in 2012 compared to about 590 in 2011.

The Government of South Sudan aims to improve the health status of the country through its current policies (the South Sudan Health Policy, NDS and Vision 2040, amongst others). These policies aim for a healthy and productive population for the people of South Sudan by strengthening the national health system. The NDS contains three-year targets for the improvement of the health sector within the country. The targets and current status are provided in Table 31.

**Table 31: Status of the health sector in South Sudan**

| Parameter | NDS target (2018–2021) | Current status |
|---|---|---|
| Government expenditure | 7% (of total expenditure) | The budget decreased from 3% in FY2018/19 to 1% in FY2019/20 (*f*nd, 2019). |
| Number of doctors | 1/10,000 people | 1/65,574 people (Global Health Workforce Alliance, 2021) |
| Number of nurses and trained staff | 2/10,000 people | 1/39,088 people (ibid.) |
| Child mortality | 30/1,000 live births | 79/1,000 live births (ibid.) |
| Maternal mortality | 400/100,000 live births | Not available |

### 7.13.2 Key strategies

*7.13.2.1 Adaptation*

High food insecurity in South Sudan has led to severe malnutrition among the population and has been responsible for several instances of acute food shortages in the country. This insecurity is deepened by climate change, which frequently gives rise to droughts and floods, impacting the food production capability of the region. Thus, climate change can have a direct and severe impact on the nutritional health of South Sudan's population. Moreover, rural communities that have limited access to clean drinking water and sanitation facilities are impacted by both water- and vector-borne diseases such as malaria, cholera, diarrhoea and respiratory diseases. Climate risks such as increased flooding further exacerbate existing health problems, as many water- and vector-borne diseases increase with higher temperatures and rainfall. This is seen in the increase in numbers of people affected by malaria and deaths caused by the disease during the peak rainy season. South Sudan will focus on the implementation of adaptation actions to reduce the vulnerability of communities (Table 32).

**Table 32: Adaptation strategies for the health sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Conduct research on climate change and human health and well-being.**<br>Funnel climate finance into research that details the interactions between climate change and various health-related impacts under different scenarios in South Sudan. | • Annual assessment of impact of vector-borne diseases such as malaria, kala-azar and trypanosomiasis on human health. | South Sudan provides a weekly integrated disease surveillance and response bulletin and monthly vector-transmitted disease burden report. | Short to long term |
| | • Annual assessment of impact of water-borne diseases on human health. | | |

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Strengthen early warning systems.**<br>Improve early warning systems to provide timely warning to the local population about disease outbreaks and epidemics. | • Develop a robust climate monitoring and forecast system in collaboration with the Department of Meteorology to identify and predict occurrences of extreme weather events, such as droughts and floods. | Weekly, monthly and seasonal meteorological forecast reports are available. Measures such as mass distribution of long-lasting insecticidal nets, indoor residual spraying and larval source management are being carried out. | Short to long term |
| **Capacity-building of communities on response measures.**<br>Develop capacities of local communities about likely health risks and appropriate response measures to reduce their vulnerability during outbreaks of climate-related diseases. | • Train different levels of stakeholders such as government staff and communities on response preparedness measures through workshops, interactive talks, etc. | Yet to be implemented | Short term |
| **Implement disease, vector surveillance and control projects.**<br>South Sudan will continue to implement disease, vector surveillance and control projects for eradication of water-borne diseases in the country. | • Assess progress achieved in controlling the spread of malaria through the Malaria Indicator Survey. | There have been reports on progress achieved in key malaria indicators since the 2013 survey was released in 2017. | Short term |
| | • Conduct a vector susceptibility study in the country. | A report on vector susceptibility has been published for South Sudan. | Short term |
| **Develop climate-resilient health systems.**<br>South Sudan will invest in building hospitals and train doctors and staff on treating climate-related diseases. | • Specific activities will be determined over the course of NDC implementation. | Yet to be implemented | Short to long term |

## 7.14 DISASTER RISK MANAGEMENT

### 7.14.1 Current status

South Sudan faces a high risk of floods (more than 1 in 100 people are at risk) and a medium risk of droughts (Aqueduct Water Risk Atlas). About 78 percent of households (primarily rural communities) are reliant on crop farming (mostly rain-fed) and animal husbandry as their main sources of livelihood. Droughts, floods and erratic rainfall impact the livelihoods of these communities, as they lead to significant losses of crops and livestock. Furthermore, floods have destroyed forests, especially in the low-lying areas, and this has had negative impacts on biodiversity and the livelihoods of communities dependent on forestry.

In 2020, about 800,000 people (approximately 6 percent of the total population) were affected by floods that inundated homes and left them without food, water and shelter.

The sector is a priority in South Sudan's Vision 2040 and the NAPA. The NAPA stresses improving collection, analysis and dissemination of weather information and strengthening drought and flood early warning systems.

South Sudan's Ministry of Humanitarian Affairs and Disaster Management Strategic Plan 2018–2020

focuses on a holistic approach that includes implementing preventive and/or development measures to reduce vulnerability in addition to emergency responses for saving lives and livelihoods. These measures include developing a disaster risk management policy, developing risk assessment and management tools, improving community preparedness and ensuring increased investments in the sector.

While the sector is a priority for the country and has been included in key adaptation plans and documents, there is no information on the likelihood and intensity of occurrences of weather events in the country. Only about five of the 28 hydrometeorological stations set up for weather monitoring and forecasting are functional. This is primarily due to lack of capacity and availability of funds in the sector.

### 7.14.2 Key strategies

#### *7.14.2.1 Adaptation*

The following table showcases adaptation actions that will be taken up in order to reduce the impacts of climate change related risks such as floods and droughts and ensure preparedness of communities and the government when it comes to handling extreme weather events.

**Table 33: Adaptation strategies for the disaster risk management sector**

| Strategies | Activities being considered | Current progress | Timeframe |
|---|---|---|---|
| **Strengthen early warning systems.**<br>In the absence of efficient early warning and disaster management systems communities remain highly vulnerable to climate-induced disasters. There is a strong need for setting up or upgrading weather monitoring stations to predict weather patterns so that appropriate measures may be taken. | • Rehabilitate five national disaster risk management centres in Juba, Wau, Malakal, Renk and Raja. | Yet to be implemented | Medium term |
| | • Carry out research to map disaster-prone areas in the country. | Yet to be implemented | Medium term |
| | • Strengthen the information and communications technology and telecommunications sector to enable the provision of timely warnings to relevant stakeholders, including government stakeholders, private players and communities. | Yet to be implemented | Medium term |
| **Awareness raising and capacity-building of stakeholders.**<br>Means of increasing knowledge and awareness amongst various stakeholders, such as government officials and communities, will be developed to enable their understanding of the risks of predicted climate-related events so that they may take suitable measures to protect lives and property. | • Raise awareness regarding possible outbreaks of events and measures to be undertaken to reduce associated risks. | Yet to be implemented | Short to medium term |
| | • Build capacity on response-preparedness of communities that are involved in agriculture and fishing activities, especially among the women. Response-preparedness will include measures such as planting drought-resilient crops, establishing farm ponds and improving water infiltration. | Yet to be implemented | Short to medium term |

# 8 INSTITUTIONAL ARRANGEMENTS

South Sudan has published various polices and plans to ensure **sustainable development and management of its natural resources.**

# INSTITUTIONAL ARRANGEMENTS

## 8.1 THE POLICY ENVIRONMENT

South Sudan has published various polices and plans to ensure sustainable development and management of its natural resources. These include frameworks to cater for the development of the economy while taking into account sustainable development objectives. The instruments that mainstream environment and/or climate change issues are provided in the section below.

### 8.1.1 National Environment Policy

The National Environment Policy seeks to protect and conserve the environment and ensures use of natural resources in a sustainable manner. The aim of the policy is to create public awareness regarding the protection of the environment and provide a basis for the formulation of environment protection and management policies, laws and guidelines. The policy oversees the implementation of international, national or regional environmental law in South Sudan. The main objectives of the policy are to:

- Develop regulations and set guidelines for sustainable management of the environment;
- Integrate environmental concerns into developmental policies and programmes at different levels, i.e., government, community and individual/private sector levels;
- Build the capacity of state and regional institutions, communities and other stakeholders in efficient environmental management; and
- Promote public participation in conservation and sustainable management of resources.

The Environment Policy recognizes climate change as a concern that is likely to have an adverse impact on the livelihoods of South Sudanese people. It identifies the climate change impacts that South Sudan is witnessing, such as changes in rainfall

patterns, increasing temperature and frequency of floods and droughts and provides measures to address climate change issues. It advocates for the development of national-level climate change policy in South Sudan, together with strategies and measures for climate change mitigation and adaptation, with the aim of supporting efforts to reduce the vulnerability of communities to climate hazards.

### 8.1.2 Environmental Protection Bill

The Environment Protection Bill was developed to provide a legal framework to cover all matters and concerns related to the environment in South Sudan. The bill empowers the Ministry of Environment and Forestry to act as a lead institution for implementing all policies related to the environment, including climate change, biodiversity, air and water pollution and monitoring land use patterns, to determine their impact on the quality and quantity of natural resources.

### 8.1.3 National Adaptation Programme of Action

The NAPA for South Sudan is the most significant of the various documents that chart the adaptation needs of the country. The NAPA identifies priority projects that will address South Sudan's urgent need for adapting to climate change. These priority projects have been identified under five thematic areas, namely environment; water resources; agriculture; disaster risk reduction and policy; and institutional framework. It lists potential adaptation activities under each thematic area to lay the foundation for climate change adaptation in South Sudan in the medium and long term.

### 8.1.4 National Policy on Food Security

The National Policy on Food Security recognizes climate change and natural disasters as threats to food security. The policy aims to implement measures to mitigate the adverse impacts of climate change on food security in the medium and long term. Its key objectives are to:

- Understand the likely impacts of climate change on resilience of key crops, agroforestry, tree species, etc.;
- Enhance the adaptive capacity of communities in drought- and flood-prone areas; and
- Support measures to protect vulnerable communities against diseases and pest outbreaks related to climate change.

Some of the implementation strategies that are proposed as part of this policy are to:

- Collaborate with the Ministry of Environment and Forestry to identify key activities that respond to immediate needs to adapt to climate change;
- Support and promote the development of intensive agriculture and diversified crops adapted to extreme climate risks;
- Map and intensify research on crops and livestock most adapted to changing climatic conditions in different agroecological zones; and
- Prevent water, soil and air pollution from agrochemicals.

### 8.1.5 Comprehensive Agricultural Master Plan, 2015–2040

The CAMP was approved by the Government of South Sudan in March 2017. It is an investment plan that was developed to align with the national policies, plans and strategies of various ministries, such as the Ministry of Agriculture and Food Security, the Ministry of Livestock and Fisheries and the Ministry of Water Resources and Irrigation. The CAMP has developed over 110 sub-sector project profiles with the aim of ensuring food security, improving livelihoods of communities and promoting sustainable agriculture and livestock rearing practices. The development themes under the CAMP and corresponding focus areas where investments are planned are as follows.

**Reconstruction and recovery**

- This theme looks at the reconstruction and recovery of the agriculture sector from internal conflict, insecurity and lack of innovation with a

view to developing the sector and supporting production and market activities, particularly in the areas that have been most affected.
- It aims to build trust between economic players and the government to reduce transaction costs.
- It also focuses on restoration of law and order by strengthening legal frameworks and their enforcement.

**Food and nutrition security**

- This theme focuses on improvement in agricultural production and productivity, which will result in increased household cash income.
- It aims to promote a cash-based economy as a rural agricultural labour market is likely to increase farmers' options to generate income for asset development and investment for production.

**Economic growth and livelihood improvement**

- The theme focuses on providing support to farmers in the transition from subsistence to commercial farming.
- With government support, input and output activities and import and export markets will be addressed, with the aim of increasing the supply of and demand for agricultural goods.

**Agriculture sector transformation**

- This theme aims to increase the value of agricultural products, both processed and unprocessed, by making outputs competitive in both international and regional markets.
- It focuses on establishment of a non-agricultural manufacturing and service sector with accumulated capital and other direct foreign investment.

**Institutional development**

- The theme aims to build a trusted public financial management system and legal and regulatory framework to mobilize external and internal financial resources for CAMP implementation (South Sudan Ministry of Agriculture, Forestry, Cooperative and Rural Development and Ministry of Livestock and Fisheries Industries, 2015).

### 8.1.6 Forest Policy

The Forest Policy lays down a clear institutional and governance framework for forests across the country. It recognizes the importance of forests for commerce, communities and conservation and sets out a series of implementation and institutional measures to protect forest reserves in the country.

The policy emphasizes the need for the implementation of sustainable forest management measures to enable South Sudan to gain access to international financing under mechanisms such as REDD+. It also proposes establishing a designated national authority so that the country can participate in the Clean Development Mechanism and facilitate the flow of climate change benefits to South Sudan.

### 8.1.7 National Electricity Policy

The South Sudan National Electricity Policy, produced by the Ministry of Electricity and Dams, outlines the framework for developing and running the electricity supply industry. It focuses on the use of indigenous energy sources, such as crude oil and hydropower, for meeting household energy demand. The policy outlines priorities for the development of the sector, including the scope for public-private partnerships. The government has identified medium- and long-term strategies for the development of the electricity sector. These include:

- Expanding the country's generation capacity to around 580 MW by 2025;
- Increasing urban households' access to electricity to 75 percent by 2025;
- Expanding the national transmission and distribution grid to link all 10 state capitals;
- Connecting South Sudan with the grids of Ethiopia, Kenya and Uganda; and
- Strengthening the environment for private investments in the power sector.

Renewable energy projects that are planned as part of the policy include:

- Importing 50–100 MW of power from Ethiopian hydropower plants;
- Developing the Fula Rapids 40 MW hydropower project; and
- Developing the Sue 15 MW mini hydropower project.

### 8.1.8 Fisheries Policy

The aim of the Fisheries Policy is to maximize fish production while avoiding overfishing and preventing degradation of wetlands. It focuses on strengthening areas like governance, research and aquaculture in the fishing sector. It also outlines objectives rated to climate change, along with corresponding strategies, institutions responsible, and timelines (Table 34).

**Table 34: Climate change strategies outlined in the Fisheries Policy**

| Objectives | Strategies | Timeframe |
|---|---|---|
| **Governance** | | |
| To respond appropriately to climate change and natural disasters | Research climate change and disaster management and develop policy advice to contribute to wider government responses | As and when necessary |
| To maintain a healthy environment and ecosystems | Ensure that compulsory ESIAs are undertaken for all developments that affect fisheries, including large-scale aquaculture developments | Ongoing as routine activity of the Directorate of Fisheries and Aquaculture Development |
| | Observe all international treaties and protocols on the environment and biodiversity | Immediate implementation, then ongoing as routine activity of the Directorate of Fisheries and Aquaculture Development |
| **Research** | | |
| To monitor environmental changes affecting fisheries, including climate change | Improve monitoring of changes in the environment and their effect on fisheries and aquaculture | Ongoing as routine activity of the Directorate of Fisheries and Aquaculture Development |
| | Establish a hydrology section in the Fisheries Research Unit, with sufficient equipment and staff to undertake routine environmental monitoring | 2019 |
| **Aquaculture** | | |
| To address environmental concerns regarding aquaculture | Include guidance on the mitigation of the effects of aquaculture on the environment in the Codes of Practice for aquaculture | 2016 |

## 8.2 MAJOR STAKEHOLDERS

### 8.2.1 Major administrative bodies for climate change

The following table details the government organizations/ministries that will play a lead role in implementing climate change/environment policies in South Sudan.

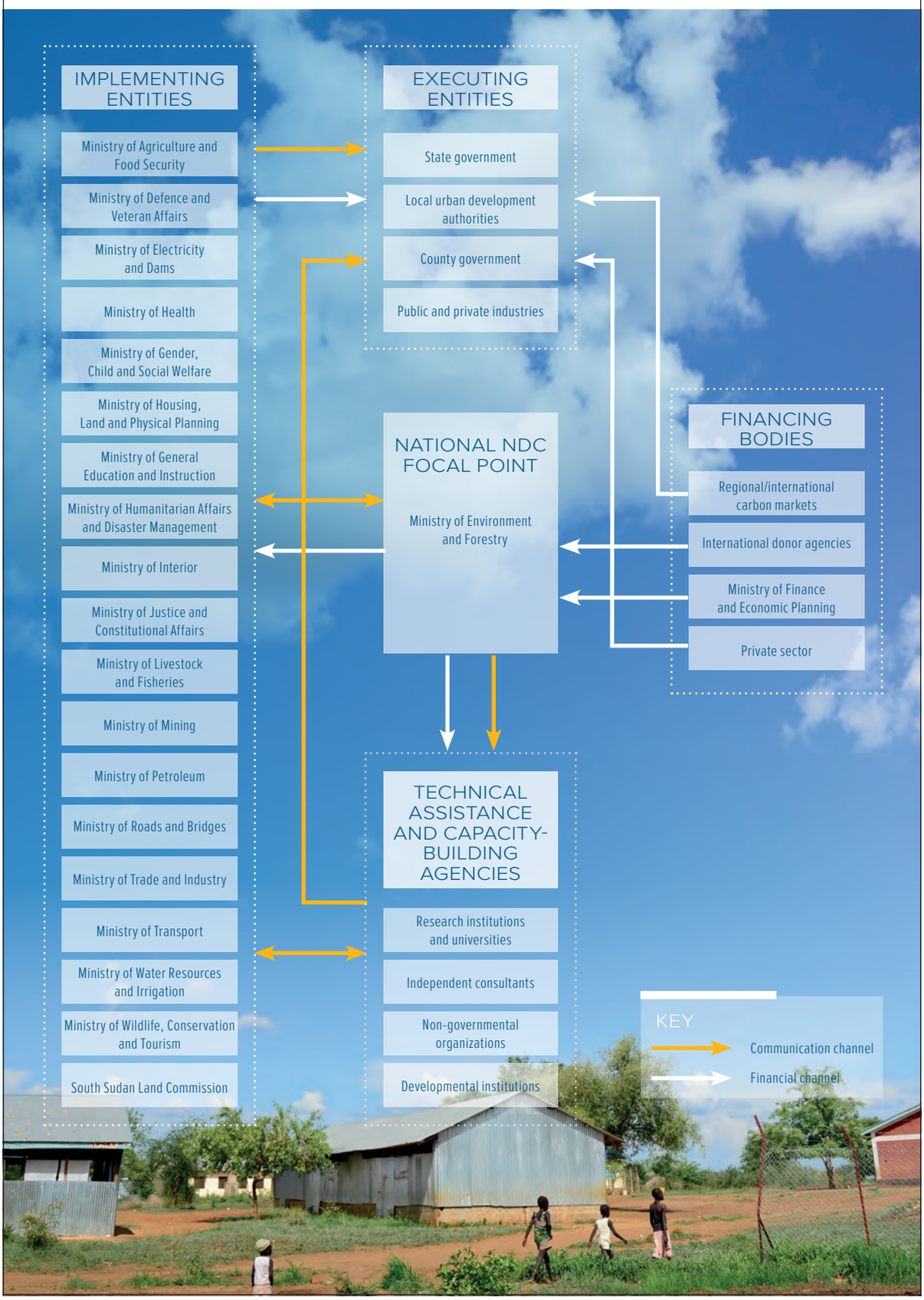
**Table 35: Major administrative bodies for climate change**

| Organization | Suborganization | Roles and responsibilities |
|---|---|---|
| Ministry of Environment and Forestry | – | The Ministry of Environment and Forestry is the lead institution responsible for formulation of policies, regulations and plans for the environment, forestry and biodiversity protection and management in South Sudan. The ministry is also the technical and operational focal point for international environmental conventions and treaties. |
| Ministry of Electricity and Dams | – | The Ministry of Electricity and Dams, the regulatory body for the power sector, is responsible for the development of electricity sector policies and regulations in South Sudan. It looks after the implementation of plans, strategies and projects in electricity generation, distribution, transmission and dams for irrigation. |
| | South Sudan Electricity Corporation | The South Sudan Electricity Corporation is the only electricity utility, responsible for generation, transmission, distribution and sales of electrical energy to consumers in Juba, Malakal and Wau. The South Sudan Electricity Corporation, an implementing body of the Ministry of Electricity and Dams, is responsible for the execution of the ministry's policies and strategies. |
| Ministry of Water Resources and Irrigation | – | The ministry is responsible for water resource management in South Sudan, looking after the management of rivers, watersheds and supply of water. |
| Ministry of Transport | South Sudan Road Authority<br>South Sudan Civil Aviation Authority | The Ministry of Transport is responsible for overall policy and regulation of the transport sector, as well as the administration of all modes of transportation – road, rail, air and river. |
| | South Sudan Meteorological Department | The South Sudan Meteorological Department operates under the Ministry of Transport (as part of the South Sudan Civil Aviation Authority) to provide weather-related and aeronautical information for air navigation. |
| Ministry of Wildlife Conservation and Tourism | South Sudan Wildlife Service | The mandate of the Ministry of Wildlife Conservation and Tourism is to protect areas in South Sudan (national parks and game reserves). It protects, conserves and manages these through the South Sudan Wildlife Service. |
| Ministry of Agriculture and Food Security | – | The ministry is responsible for enhancing agricultural productivity with the aim of improving food security, driving economic growth, and facilitating and encouraging sustainable development for improved livelihoods. |
| Ministry of Livestock and Fisheries | – | This ministry is charged with livestock and fisheries development policies. The ministry's roles include preparing and enforcing regulations and guidelines related to livestock disease tracking and control and ensuring the safety of food of animal origin. |

| Organization | Suborganization | Roles and responsibilities |
|---|---|---|
| Ministry of Humanitarian Affairs and Disaster Management | – | The ministry is responsible for developing policy and decision-making on disaster risk reduction at the national level. Its mandate is to oversee all humanitarian work in South Sudan. |
| Ministry of Finance and Economic Planning | – | The Ministry of Finance and Economic Planning is responsible for developing South Sudan's finance policies, as well as for public financial management, tax and revenue collection, procurement and legislation. It is also responsible for allocating financial resources to government agencies, thus enabling them to implement sectoral plans and policies. |
| Ministry of Petroleum | – | The Ministry of Petroleum is responsible for formulating legislation and regulations for the management and development of South Sudan's oil and gas sector, as well as for the supply of petroleum products for power generation. |
| Ministry of Mining | – | The Ministry of Mining is responsible for developing and implementing policies, regulations and legal frameworks for the development and sustainable management of mineral resources in South Sudan. |
| National Bureau of Statistics | – | The National Bureau of Statistics is responsible for collecting and analysing national-level economic, social and demographic statistics in South Sudan. |
| Ministry of Housing, Land and Physical Planning | – | The Ministry of Housing, Land and Physical Planning is the national-level institution responsible for land governance, land use planning and urban development in South Sudan. |
| Ministry of Roads and Bridges | – | The Ministry of Roads and Bridges is responsible for carrying out research related to roads and developing affordable, efficient, and safe road transportation infrastructure in the country. |
| Ministry of Defence and Veteran Affairs | – | The ministry is responsible for defending and protecting citizens, maintaining peace and sustaining the conditions that will enable stability, unity and economic growth in the country. The ministry is also responsible for helping civilian authorities in cases of emergency and natural disaster. |
| Ministry of Justice and Constitutional Affairs | – | The Ministry of Justice and Constitutional Affairs is responsible for representing the Government of South Sudan in legal matters, drafting statutory laws, informing the general public of legal frameworks and documents, and overseeing the legal profession in South Sudan. |
| Ministry of General Education and Instruction | – | The Ministry of General Education and Instruction is mandated to develop policies and regulations with the aim of providing basic education to all children, eradicating illiteracy, improving the status of women and providing equitable access to learning opportunities for all South Sudanese people. |
| Ministry of Gender, Child and Social Welfare | – | The ministry is responsible for developing and implementing policies that promote gender equality, social inclusion and justice, and safeguard the rights of women, children and other vulnerable groups. |

| Organization | Suborganization | Roles and responsibilities |
|---|---|---|
| South Sudan Land Commission | – | South Sudan Land Commission is responsible for developing and coordinating policies such as the Land Act and other legal frameworks related to land, land governance and land rights in the country. |
| Ministry of Interior | – | The Ministry of Interior is responsible for law enforcement and maintenance of order in South Sudan. |
| Ministry of Trade and Industry | – | The Ministry of Trade and Industry is responsible for development and management of industries and commercial activities in the country. |
| Ministry of Health | – | The Ministry of Health is responsible for developing and managing health facilities across the country, training and education of health workers, and ensuring robust systems are in place to achieve its responsibilities. |

**Figure 53: Institutional framework for NDC implementation**



### 8.2.2 International donor agencies and regional stakeholders

Besides regulatory bodies and ministries, international donor agencies and regional stakeholders (e.g., educational institutions, non-governmental organizations and private players, such as industries) will need to be involved for NDC implementation (Table 36).

**Table 36: Stakeholders active in climate change**

| Organizations | Roles and responsibilities |
|---|---|
| Research institutions and universities | The implementation of the NDC will require inputs from research institutions and/or universities that are actively working in the climate change space, on agriculture, forestry and fisheries, amongst others. Examples of these institutions include the Yei Agricultural Research Centre, the Palataka Agricultural Research Centre and the Halima Agricultural Research Centre. |
| International donor agencies | International donor agencies such as the AfDB, Japan International Corporation Agency, World Bank, United Nations Development Programme and USAID are actively involved in implementing projects related to development and climate change in South Sudan. These organizations will play a significant role in implementation of the NDC, especially in providing access to financial resources and technical assistance. |
| Private sector | NDC implementation will require support from local, regional and other large private players in the country, such as industries and private businesses. |

## 8.3 INSTITUTIONAL FRAMEWORK FOR NDC IMPLEMENTATION

The institutional framework for NDC implementation will include the following bodies:

- National NDC Focal Point
- NDC implementing entities
- NDC executing entities
- Technical assistance and capacity-building agencies
- Financing bodies

The following section provides an in-depth understanding of the roles and responsibilities of the bodies shown in Figure 53.

### National NDC Focal Point

The Ministry of Environment and Forestry will act as the national NDC Focal Point for the implementation of the NDC in South Sudan. A separate environmental authority/department, which will be responsible for coordination and harmonization of NDC activities with all other relevant ministries, will be created within the Ministry of Environment and Forestry.

The responsibilities of the NDC Focal Point will include:

- The overall administration of NDC implementation;
- Coordinating with implementing agencies regarding implementation of sectoral plans and strategies;
- Approving implementation of sectoral targets, projects and interventions;
- Acting as a monitoring body to track the progress of implemented projects;
- Acting as a primary contact point for both national and international financing agencies; and
- Disbursing funds to implementing entities, technical assistance bodies and capacity-building agencies and supervising financial flows between different agencies.

### NDC implementing entities

National-level government bodies and ministries will act as implementing entities – the main bodies looking after the operations of planned projects and strategies. The tasks that will be performed by the implementing entities are given below:

- Support the Ministry of Environment and Forestry in implementation of planned interventions.

- Develop sectoral policies and regulations in coordination with the Ministry of Environment and Forestry.
- Ensure proper disbursement of funds to executing entities.
- Coordinate with executing entities to provide and/or facilitate the necessary technical support, training, etc., required for the implementation of NDC interventions.
- Regularly monitor the implementation of interventions and prepare reports on targets achieved and use of funds.

Table 37 provides details of the ministries that will be implementing entities for developing and implementing NDC sectoral interventions.

In addition to the ministries listed in Table 37 that are responsible for implementation of sectoral NDC activities, other national-level ministries will provide support across all sectors (Table 38).

**Table 37: NDC implementing entities**

| Sector | Implementing entity |
|---|---|
| Agriculture, livestock and fisheries | The Ministry of Agriculture and Food Security and the Ministry of Livestock and Fisheries, with the support of the Ministry of Water Resources and Irrigation, will be responsible for development and implementation of policies for the agriculture, livestock and fisheries sector in South Sudan. |
| Infrastructure (construction and buildings) | The Ministry of Housing, Land and Physical Planning will be the main implementing entity responsible for the formulation and development of policies (e.g., national building codes, ESIA guidelines) to ensure low-carbon and climate-resilient development of any new infrastructure in South Sudan. The ministry will be supported by other sectoral ministries for which development of infrastructure is a priority, such as the Ministry of Transport for construction of climate-resilient transport infrastructure, the Ministry of Wildlife Conservation and Tourism for construction of tourism infrastructure and the South Sudan Land Commission for development of large infrastructure projects. |
| Forestry | The Ministry of Environment and Forestry will act as implementing entity for this sector. The ministry, with the support of the state forest departments and the Ministry of Wildlife Conservation and Tourism, will be responsible for implementation of sustainable forest management, reforestation and afforestation projects, as well as the promotion of the REDD+ programme. |
| Biodiversity, ecosystem and sustainable wetland management | The Ministry of Wildlife Conservation and Tourism will act as implementing entity for this sector. The ministry will be responsible for developing and implementing ecosystem and biodiversity management measures. The ministry will be supported by the Ministry of Water Resources and Irrigation for planning and execution of wetland and other water resource management projects. |
| Electricity | The Ministry of Electricity and Dams will act as the implementing entity for feasibility and development projects for renewable energy-based electricity generation in South Sudan. |
| Water | The Ministry of Water Resources and Irrigation will be the main implementing entity for execution of water-related projects. The ministry will be supported by the Ministry of Agriculture and Food Security for implementation of water harvesting projects targeted at the agriculture sector. |
| Waste | The Ministry of Environment and Forestry will be the implementing entity for this sector. Its role will be to develop waste management, promote waste recycling and invest in solid and liquid waste management infrastructure in South Sudan. |
| Tourism and recreation | The Ministry of Wildlife Conservation and Tourism will be the implementing entity for the tourism and recreation sector. It will be responsible for integrating ecotourism in existing tourism policies and developing regulations for efficient waste management in the tourism and recreation sector. The ministry will be supported in promoting the use of EVs by the Ministry of Transport, and sustainable food consumption by the Ministry of Agriculture and Food Security. |

| Sector | Implementing entity |
|---|---|
| Mining and quarrying | The Ministry of Mining will be the implementing entity for the mining and quarrying sector. The ministry will be responsible for strengthening institutional and governance mechanisms to restrict illegal mining and ensure compliance with ESIAs, environment management plans and sustainable mining closure plans. The ministry will also promote energy efficiency measures to reduce the carbon footprint of mining and quarrying processes. |
| Transport | The Ministry of Transport and Ministry of Roads and Bridges will be the main implementing entities responsible for formulation and development of policies for the transport sector, such as vehicular emission standards and regulations for promoting the use of EVs in the country. The South Sudan Roads Authority will support the development of climate-resilient road infrastructure in South Sudan. |
| Industry | The Ministry of Trade and Industry will act as implementing entity for this sector. The ministry will be responsible for the formulation of policies and regulations to ensure green growth of industries, such as in the reduction of environmental pollution, efficient waste management, and use of alternative fuels and energy-efficient technologies in industrial operations. The ministry will be supported by the Ministry of Environment and Forestry in the planning and execution of industrial waste management programmes. |
| Petroleum, chemical and non-metallic mineral products | The Ministry of Petroleum will be the implementing entity for this sector. It will be responsible for implementation of sustainable and low-carbon measures to reduce the carbon footprint of petroleum extraction and refining processes. |
| Health | The Ministry of Health will be the implementing entity responsible for research on climate change and its health impacts on the South Sudanese people. It will also be responsible for early warning and building capacities for adequate response during disease outbreaks. |
| Disaster risk management | The Ministry of Humanitarian Affairs and Disaster Management will be the implementing entity for this sector. It will be responsible for improving early warning systems, raising awareness among various stakeholders and capacity-building on community response measures. The South Sudan Meteorological Department (which operates under the Ministry of Transport) will support the Ministry of Humanitarian Affairs in improving early warning systems in South Sudan. |

**Table 38: Implementing entities across sectors**

| Sector | Implementing entity |
|---|---|
| Ministry of Gender, Child and Social Welfare | The Ministry of Gender, Child and Social Welfare will be responsible for ensuring integration of gender perspectives and social justice in relevant climate mitigation and adaptation interventions across all NDC sectors. It will promote women's empowerment and target improving the status of the most vulnerable groups in the country. |
| Ministry of General Education and Instruction | The Ministry of General Education and Instruction will support other ministries in creating awareness around climate change and capacity-building of various stakeholders, including government institutions and local communities. |
| Ministry of Interior | The Ministry of Interior will ensure enforcement of the NDC for its effective implementation across all sectors and regions. |
| Ministry of Justice and Constitutional Affairs | The Ministry of Justice and Constitutional Affairs will ensure that the NDC and the NDC interventions are legally adopted and enacted by the Parliament of South Sudan. |
| Ministry of Defence and Veteran Affairs | The Ministry of Defence and Veteran Affairs will ensure implementation of NDC interventions and coordination across all sectors. In particular, it will support the Ministry of Environment and Forestry in reducing the rate of deforestation in the country. It will also be responsible for ensuring that a safe and secure environment is available for the implementation of NDC projects. |

**NDC executing entities**

Local-level government bodies (e.g., county bodies, Urban Development Authority), public and private businesses and non-governmental organizations will act as NDC executing entities, and will be responsible for on-the-ground implementation and operations of the planned NDC interventions. Executing entities will perform the following tasks:

- Support implementing entities in execution of planned interventions.
- Prepare regular reports on progress and performance of interventions and use of funds to keep implementing entities updated on the status of projects.

**Technical assistance and capacity-building agencies**

Implementation of the South Sudan NDC will require technical support and capacity-building for government bodies and other institutions involved in the implementation framework. It will also require the development of an outreach programme to attract the private sector to adopt the NDC. The technical assistance and capacity-building programme will be carried out by research institutions and universities, non-governmental organizations, development agencies and independent consultants. The main tasks of technical assistance and capacity-building agencies will include:

- Supporting government bodies (NDC Focal Point and implementing entities) in carrying out feasibility studies for project implementation.
- Providing sector and stakeholder-specific technical support and guidance in development and implementation of the NDC projects.
- Providing stakeholder-oriented training to the Ministry of Environment and Forestry, implementing entities and executing entities, tailored to their needs through interactive seminars and workshops.
- Developing an outreach programme to engage the private sector in NDC implementation.

**Financing bodies**

The manner in which funds for implementation of the NDC will flow from a financing body to the implementing or executing entity will depend on the source of financing. The National NDC Focal Point will act as a primary contact in the case of financing sourced from international developmental financial institutions. However, financing can be offered directly to the project proponent on the ground in the case of direct sources such as private investors and/or carbon markets. The funds can come from the following sources:

- **Ministry of Finance and Economic Planning:** The ministry will provide domestic funding to the Ministry of Environment and Forestry who will disburse it to the relevant implementing entities.
- **International donor agencies:** The Ministry of Environment and Forestry can also access funding from international donor agencies, such as the United Nations Development Programme, World Bank and AfDB.
- **Regional/international carbon markets**: Individual private players and other executing entities of GHG emission reduction projects can access international climate finance by trading carbon credits through participation in regional carbon markets (e.g., Ethiopia's planned carbon market) or global voluntary carbon markets (e.g., the Gold Standard and Verified Carbon Standard).
- **Private sector:** The private sector provides funds from actors operating at international, national and local levels. South Sudan can increasingly engage with the private sector to promote green growth along supply chains that they manage. The country can also deploy different approaches to mobilize private finance in climate change mitigation and adaptation (e.g., by developing policy to create feed-in tariffs for specific renewable energy technologies, which in turn increases the profitability of clean energy investments).

# 9 CAPACITY-BUILDING AND TECHNOLOGY TRANSFER

## CAPACITY-BUILDING AND TECHNOLOGY TRANSFER

Capacity-building and knowledge transfer play a crucial role in implementation of NDC interventions and achieving the goals of the Paris Agreement. For effective implementation of the NDC, South Sudan will need to increase the awareness of individuals, government institutions, communities and other stakeholders on the importance of addressing climate change, and enhance their ability to access climate-related information, enabling improved decision-making at national, state and individual levels. In this regard, South Sudan plans to carry out the following interventions:

- Develop climate-change awareness programmes to disseminate information amongst the wider public.
- Update school curricula to include climate change, environmental management and other relevant topics with the aim of increasing awareness among youth.
- Utilize the capacities of universities and research institutions such as the Sudd Institute, Yei Agricultural Research Centre, Palataka Agricultural Research Centre and Halima Agricultural Research Centre to support the government in carrying out research and developing and implementing capacity-building plans at national, state and county levels. These institutions can support the government by:
    - Conducting vulnerability assessments and identifying climate-related risks;
    - Developing and implementing community-based adaptation plans;
    - Conducting cost-benefit analyses of adaptation options and sharing best practices to prioritize implementation of interventions;
    - Developing climate-change awareness programmes and dissemination of information; and
    - Collecting, analysing and applying hydrometeorological and climate data for decision-making and broadcasting of early warnings.
- Access international support to build the technical capacity of government institutions (or NDC implementing and executing entities) for implementation of NDC interventions.
- Focus on enhancing institutional capacity and governance mechanisms to enhance cross-sectoral and interministerial coordination for climate action in the country. Strong governance will also enable South Sudan to access climate finance from the international donor community.

Apart from capacity-building needs, the Government of South Sudan has also identified areas where international technology transfer will be required for execution of mitigation and adaptation interventions. These include:

- Renewable energy and energy-efficient technologies;
- Access to climate information systems to carry out real time monitoring of hydrometeorological events and establish early warning systems;
- Technologies that can be used for water recycling, harvesting, irrigation and sustainable management of water resources;
- Availability of tools and methodologies to assess climate vulnerability, risks and impacts, and to identify adaptation options;
- Transportation technologies that are resilient to the adverse impacts of climate change, particularly roads and large-scale transportation of goods; and
- Technologies for the protection and development of climate-resilient infrastructure, especially for development of flood-proof infrastructure.

# 10 NDC GENDER-RESPONSIVENESS

To ensure that women are at the centre of climate action, South Sudan intends to **adopt a multitude of interventions.**

## NDC GENDER-RESPONSIVENESS

Women play a vital role in climate change mitigation and adaptation, given their significant involvement in climate-sensitive sectors such as agriculture, fisheries, forestry and health. Women's traditional and local knowledge on the use and sustainable management of natural resources is a valuable resource, especially when it comes to adaptation planning. However, women are disproportionately affected by the negative impacts of climate change while suffering from unequal access to economic resources, climate information and decision-making power, which makes them even more vulnerable. Understanding the gender-differentiated impacts of climate change and empowering and utilizing the knowledge of all people, regardless of gender, will lead to the development of effective responses for the management of climate risks in a fair and just manner.

To ensure that women are at the centre of climate action, South Sudan intends to adopt a multitude of interventions (Table 39). This will also enable South Sudan to access international climate finance (e.g., from Global Environment Facility and Green Climate Fund), which recognize the importance of women in addressing the challenge of climate change.

**Table 39: Strategies for gender inclusion in the NDC**

| Strategies | Target group | Current progress |
|---|---|---|
| Integrate a gender perspective into national-level climate change policies and strategies. South Sudan will target 35% representation of women in decision-making related to climate change – as per the Revitalised Agreement on the Resolution of the Conflict in the Republic of South Sudan. | Women | A gender focal point has been nominated from the Ministry of Environment and Forestry. |
| Integrate a gender perspective into climate change mitigation and adaptation interventions. Principles of gender equality and women empowerment will be included in climate financing. | Women | Climate-related programmes that directly impact women's health and well-being are increasingly being taken up in the country (e.g., introducing improved cooking stoves, which contribute to a variety of benefits apart from emission reduction, such as energy security for the family and improved health due to a reduction in indoor air pollution). |
| Consider inclusion of women and other vulnerable groups when carrying out vulnerability assessments to ensure that evaluations do not focus solely on economic sectors dominated by men. | Women, men, girls and boys | Specific considerations are given to issues that impact women. |
| Engage with men and women to build adaptation plans by utilizing their indigenous knowledge. This particularly involves working with women in community-based adaptation planning, using their skills and knowledge on natural resource management. | Women, men, girls and boys; and women's social networks | Both men and women are informed about appropriate response measures to extreme climatic change. The government involves women's groups in planning and implementation of community-based adaptation projects. |
| Ensure that the burdens and opportunities created by climate change mitigation and adaptation interventions are equitable. | Women (ensure 35% representation of women in climate action, as per the Revitalised Agreement on the Resolution of the Conflict in the Republic of South Sudan) | Women participate equally with men and contribute to climate change adaptation projects in the country. |
| Strengthen adaptive capacity of communities using a gender and human rights approach. This will involve making information, training and technologies for climate change adaptation and mitigation accessible to and relevant for all stakeholders. | Community members | Awareness training on climate change adaptation and mitigation and disaster risk management has been conducted. |

# 11 NDC **FINANCING REQUIREMENTS**

# NDC FINANCING REQUIREMENTS

## 11.1 PROPOSED FINANCE REQUIRED

Access to finance plays a critical role in making the transition to a low-carbon and climate-resilient economy. The government of South Sudan has estimated that the country will require financing worth $100 billion to make the country resilient over the coming decades. In order to achieve the targets set within the second NDC, initial estimates suggest that South Sudan will require $376.3 million for implementing adaptation actions in the agriculture, livestock and fisheries; infrastructure (construction and buildings); forests; biodiversity, ecosystem and sustainable wetland management; water; tourism and recreation; health; and disaster risk management sectors. With regard to mitigation, a total of $10,356.1 million is required for GHG reduction in the agriculture, livestock and fisheries; forestry; electricity; waste; infrastructure (construction and buildings); transport; and tourism and recreation sectors. The total, amounting to $10,732.4 million, is required for a period of 10 years.

Table 40 indicates proposed investment by sector required for implementation of NDC adaptation strategies. These financial estimates were provided by the Ministry of Environment and Forestry.

**Table 40: Financing requirements for NDC adaptation strategies[8]**

| Sector | Actions | Specific 2030 target | Financing required (million $) |
|---|---|---|---|
| Agriculture, livestock and fisheries | Initiate bee-keeping project | Cover 3,000 farmers in Upper Nile Region, 5,000 farmers in Bahr el Ghazal Region and 6,000 farmers in Greater Equatorial | 10 |
| | Initiate rangeland mapping and water management project | Cover 20,000 farmer households in Upper Nile Region, Bahr El Gazal Region and Greater Equatorial | 5 |
| | Initiate quarantine system project for pastoralists | – | 0.5 |
| | Initiate crop pest and disease control project for farmers across the country | – | 1 |
| | Promote climate-smart agriculture | – | 3 |
| | Establish seed breeding and seed bank centre | – | 5 |
| | Promote small-scale aquaculture | Improve food security by empowering 10% of farmers across the country | 1 |
| Infrastructure (construction and buildings) | Develop climate resilience and green infrastructure (in human settlements in urban areas) | – | 1 |
| | Establish urban drainage water channels | Cover Juba city and the three capitals of the former three regions (Malakal, Wau and Juba) | 0.8 |
| Forestry | Develop agroforestry (in Western Equatorial State) | – | 0.5 |
| Biodiversity, ecosystem and sustainable wetland management | Develop inventory of wetlands and carry out biodiversity hotspot mapping | – | 0.5 |
| | Carry out integrated natural resources management | – | 200 |
| Water | Launch a water supply project to provide clean drinking water in urban and rural areas | – | 7 |
| | Develop livestock water catchment and water harvesting techniques in water-scarce areas | – | 10 |
| | Rehabilitate northern Upper Nile irrigation scheme | Cover 20% of farmers in the area | 100 |

8 Data provided by the Government of South Sudan.

| Sector | Actions | Specific 2030 target | Financing required (million $) |
|---|---|---|---|
| Tourism and recreation | Promote community-based ecotourism in Southern National Park | – | 1 |
| Disaster risk management | Strengthen the early warning system | Rehabilitate existing five centres (Juba, Wau, Malakal, Renk and Raja) | 10 |
| Health | Launch disease and vector surveillance and control project | Eradicate water-borne diseases | 20 |
| **Total** | | | **376.3** |

Table 41 indicates proposed investment by sector required for implementation of NDC mitigation (for existing and additional) strategies. The financial requirements for existing mitigation actions are based on inputs provided by the Government of South Sudan. The costs for additional strategies have been estimated using global marginal abatement cost curves (Gillingham and Stock, 2018).

**Table 41: Financing requirement for NDC mitigation strategies[9]**

| Sector | Actions | Specific 2030 target | Financing required (million $) |
|---|---|---|---|
| Electricity | Scale up the use of renewable energy | Installation of the following hydropower plants:<br>• Fulla (1800 MW)<br>• Shukoli (3.5 MW)<br>• Beden (400 MW)<br>• Lakki (210 MW)<br>• Sue (12 MW)<br>• Kentti (3.5 MW) | 4,000 |
| | Launch rural solar photovoltaic electrification project | – | 500 |
| | Promote environmentally sustainable use of biogas (for electricity generation and cooking) | – | 1.5 |
| | Construct wind power plant | Installation of wind turbine in Eastern Equatoria, Upper Nile and Jonglei | 100 |
| | Introduce the use of energy-saving cooking stoves | – | 1 |
| Transport | Establish emissions standards for vehicles | – | 1.5 |
| | Improve transport infrastructure and integrated national transportation system (introduce electrical railway and cars) | – | 200 |
| Waste | Establish an integrated waste management system, including all waste sources (forest, agricultural, domestic and crude oil waste) | Improve urban and industrial wastewater treatment, ensuring adequate quantity and quality of water in human settlements. | |
| | | Use urban waste as a high-value resource stream (e.g., in making briquettes) | |
| | | Reduce, reuse and recycle solid waste | 20 |
| Forestry | Afforestation | – | 10 |
| | Conserve forests through implementation of REDD+ programme and promote alternate livelihoods | – | 6.5 |
| | Reforestation (in degraded areas and outside forest areas) | – | 7 |

9 Data provided by the Government of South Sudan

| Sector | Actions | Specific 2030 target | Financing required (million $) |
|---|---|---|---|
| Forestry | Awareness raising and capacity-building on forest conservation and REDD+ | – | 5.5 |
| | Review Forest Policy | – | 1.5 |
| | Conduct forestry research (identification and development of fast-growing tree species, information dissemination) | – | 15 |
| | Promote agroforestry | – | 8 |
| Biodiversity, ecosystem and wetland management | Conservation and sustainable use of wetlands for improved carbon sequestration | Wetland survey and mapping | 10 |
| | | Create buffer zones along wetland areas | 5 |
| **Financing for additional mitigation strategies (estimated using marginal abatement cost curves)** | | | |
| Agriculture, livestock and fisheries | Efficient soil and livestock management | 18% reduction in GHG emissions by 2030 compared to 2017 levels | 4,279.7–5,330.8 |
| Waste | Landfill gas recovery, composting of organic waste and engineered wastewater management | 30% reduction in GHG emissions compared to baseline in 2030 | 126.9 |
| Tourism and recreation | Composting of organic waste, promotion of sustainable food and EVs in the sector | 66% reduction in GHG emissions compared to baseline in 2030 | 0.4–6 |
| **Total** | | | **9,299.5–10,356.1** |

Marginal abatement cost curves showcase the marginal costs of achieving a cumulative level of emission abatement in order, from least to most expensive mitigation technology or measures (Gillingham and Stock, 2018). The financial requirements for the three sectors have been calculated using the estimated cumulative emission reduction potential for these sectors (Chapter 7) and cost per tonne of emission reduction possible using the mitigation technology and/or intervention being considered. For instance, emission reduction potential for the agriculture, livestock and fisheries sector is estimated to be 75.08 million $tCO_2e$ by 2030 and the marginal abatement cost of livestock management policies is $71 per tonne of carbon dioxide equivalent. Using this information, the financing requirement for implementation of livestock management policies is calculated to be $5,330.2 million.

## 11.2 FINANCIAL INSTRUMENTS FOR NDC IMPLEMENTATION

South Sudan can receive financing through diverse resource streams to implement prioritized climate change mitigation and adaptation activities. The following are some of the key financial instruments and mechanisms.

**Multilateral and bilateral grants:** Grants play an integral role in multilateral and bilateral financing. They can be used for implementation of non-revenue generating activities that do not generate financial returns (e.g., capacity-building programmes, technical assistance and ongoing activities). Grants can be used to help capitalize financial mechanisms related to ecosystem management, forestry and biodiversity conservation. Sources of grants include the World Bank and AfDB.

**Non-concessional loans:** Non-concessional loans, which generally are received from private sector players at market-based interest rates, can be used for the development of climate-resilient infrastructure or for other revenue-generating projects in sectors such as electricity and tourism.

**Concessional loans:** Concessional loans are characterized by longer repayment terms and lower or zero interest rates for climate change activities. These loans can be directed towards low-carbon technologies that are economically viable but face market- and finance-related challenges (e.g., energy efficient technologies). Development financial institutions are the main sources of concessional loans.

**Regional and international carbon markets:** Regional and international carbon markets can play a significant role in increasing private sector participation in NDC implementation by providing economic incentives through trading emission reduction credits. Carbon markets can be used particularly by the waste and renewable energy sectors in South Sudan.

Table 42 provides details of funds that actively support climate change mitigation and adaptation activities in sub-Saharan Africa and could therefore serve as channels for finance flows for NDC implementation in South Sudan.

**Table 42: Climate funds supporting sub-Saharan Africa**

| Name of fund | Focal sector | Description | Financial instrument |
|---|---|---|---|
| **United Nations Framework Convention on Climate Change climate finance mechanisms** | | | |
| Green Climate Fund | Adaptation and mitigation | Provides financial support to developing countries to enable climate action | Grants and concessional loans |
| United Nations Adaptation Fund | Adaptation | Supports implementation of adaptation projects in developing countries that are vulnerable to the impacts of climate change | Grants |
| The Least Developed Country Fund | Adaptation | Supports least developed countries in the preparation and implementation of their NAPAs | Grants |
| Global Environment Facility | Adaptation and mitigation | Provides funds for developing countries and countries with economies in transition to meet the objectives of international environmental conventions and agreements | Grants and co-financing |
| **Others** | | | |
| Clean Technology Fund | Mitigation | Promotes scaled-up financing for deployment of low-carbon technologies. | Grants, concessional loans |
| Pilot Programme for Climate Resilience | Adaptation | Supports developing countries to integrate climate resilience into national goals and strategies | Grants and concessional loans |
| Forest Investment Programme | Mitigation | Provides finance to developing countries for managing forest resources and reducing deforestation and degradation. | Grants |
| Scaling-up Renewable Energy Programme | Mitigation | Provides technical assistance to USAID partner countries for scaling up renewable and clean energy | Grants |
| Global Climate Change Alliance (European Union) | Adaptation and mitigation | Helps climate-vulnerable countries increase their resilience | Grants, technical assistance, official development assistance |
| United Nations REDD Programme (multi-donor trust fund) | Mitigation | Supports developing countries in reducing deforestation and builds the capacity of governments to prepare and implement national REDD strategies | Grants |

# 12 INTERNATIONAL **COOPERATION**


## INTERNATIONAL COOPERATION

South Sudan is the youngest least-developed country in the world. As a result of long-term conflicts and continued instability, the country lacks efficient socio-economic infrastructure and has limited capacity to develop policies and programmes to boost economic growth. Poverty rates are very high and subsistence agriculture remains the main source of income for the majority of the population.

South Sudan's economy is highly dependent on natural resources and the country is already facing serious challenges due to climate change, such as floods and droughts. According to the Climate Change Vulnerability Index 2017, South Sudan is the fifth most vulnerable country to climate change in the world. This is because the majority of the population is dependent on climate-sensitive sectors for their livelihoods (e.g., agriculture, forestry resources and fisheries) and likely changes in temperature and rainfall intensity may have long-lasting negative impacts on the already poor health, nutrition and economic status of the country.

To reduce the vulnerability of communities, immediate climate action is required, but South Sudan has limited domestic capacity to tackle climate-change concerns. Therefore, financial, technological and capacity-building support will be necessary to enable and accelerate national climate action. Access to new and sustained sources of climate finance will play a crucial role in achieving the goals of the Paris Agreement and in implementing NDC mitigation and adaptation activities in South Sudan. To enable the implementation of interventions that are identified as part of this NDC document it is important that South Sudan is provided with opportunities to access technical and financial support from the international community.

South Sudan is willing to finance **$6.5–7 billion** while international investments of **$93–93.5 billion** will be required over a period of 10 years. These are preliminary estimates; full-scale assessment of international climate finance needs will be carried out as implementation of the NDC begins.

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